





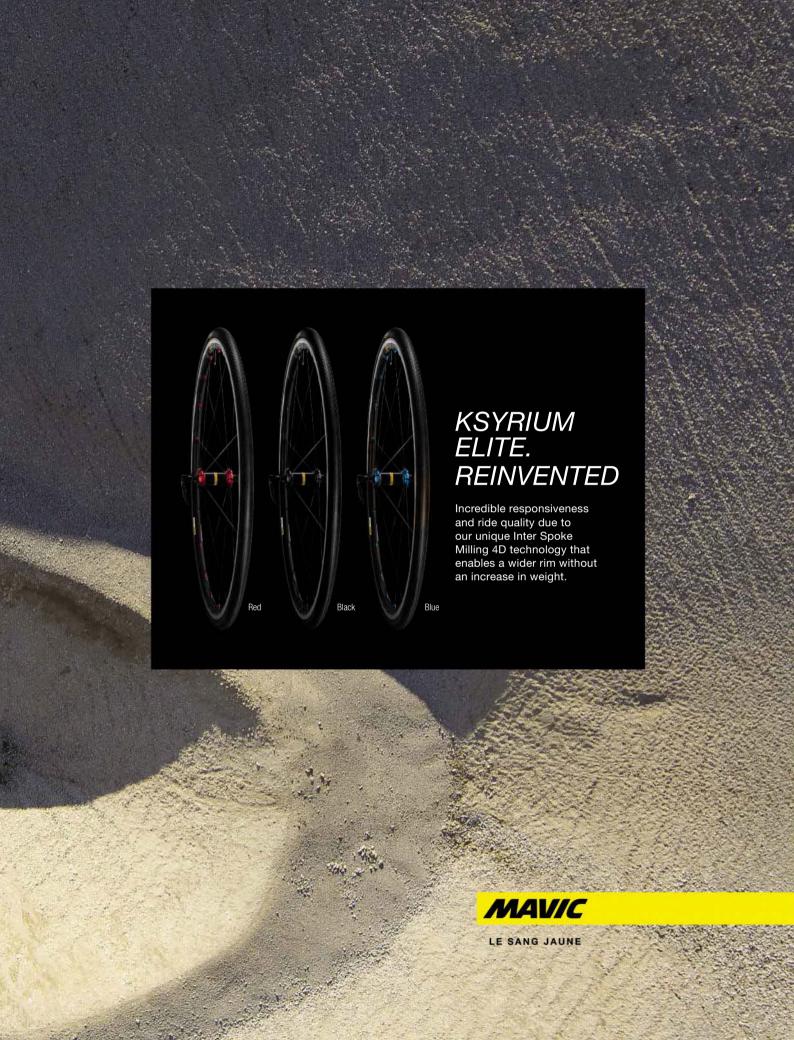
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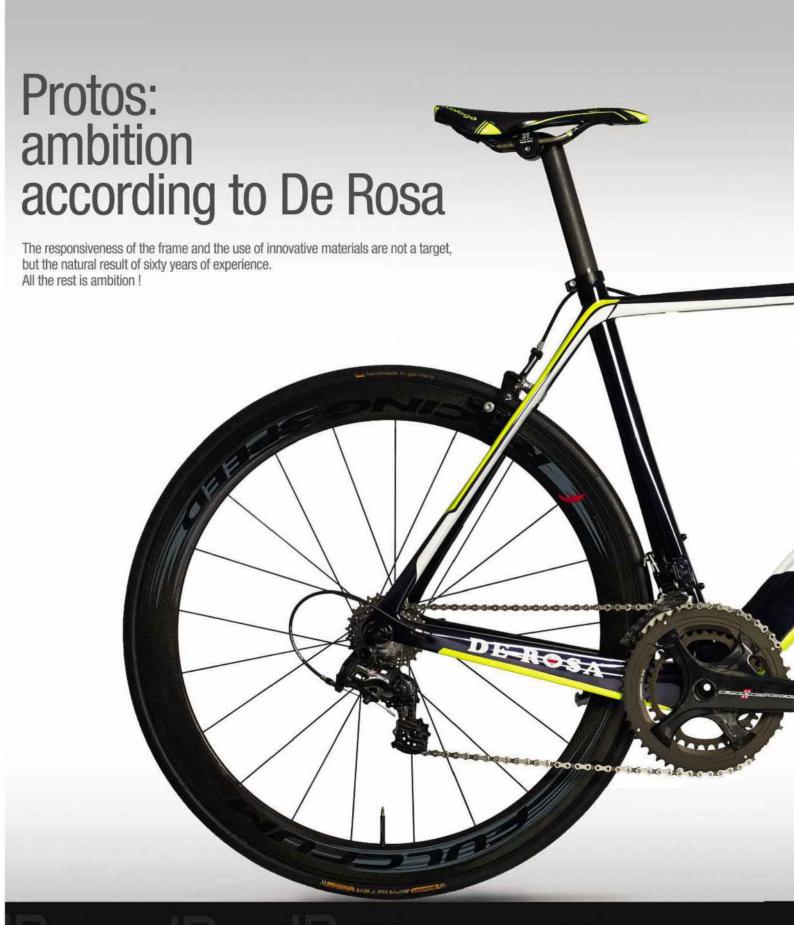
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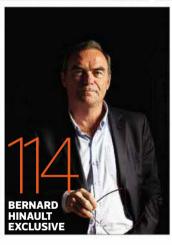


LOOK [IN SYSTEM Summer 2015 // Issue 37 النظافة حركة طيبة لمؤسسة نظيفة النظافة علامة من علامات التحضر ولية كل قرد Born In France, Raised In Africa Commercial pressures forced Look to move its production - but rather than head for the Far East, it settled on the former French colony of Tunisia... CYCLIST 9

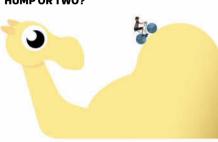












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ast issue I bemoaned how tough the world of cycling seemed to have become, with sportives getting ever longer and more brutal, and Strava goading us to push harder on every climb. Haven't we suffered enough?

Well, plainly not. This month I got a lesson in just how pampered we modern riders are, and just how pitiful my pleas for clemency were. First, we interviewed French legend Bernard Hinault (see p114), a man so tough he once started a fist fight with a crowd of striking shipyard workers who were getting in his way during the 1984 Paris-Nice. At the 1977 Dauphiné he fell down a ravine, before climbing back up, getting back on his bike, and riding on to win the stage and the whole race. Then he rode through a snowstorm to win the 244km Liège-Bastogne-Liège in 1980, getting frostbite in his fingers as a result. Now that's suffering on a bike.

But then we looked further back in time, to the very first Tour de France in 1903, won by Maurice Garin (see p152), and it all started to get a bit Pythonesque...

'Frostbite? You were lucky,' Garin would no doubt have responded if he were alive today. In my day, I had to leave my work as chimney sweep, cycle 467km from Paris to Lyon on roads made of dirt and gravel, with no team support, on

a bike that weighed about the same as a small horse.

'Derailleurs? Luxury! Oh, how I dreamed of derailleurs. I had one sprocket, which I had to ride for the whole 2,428km of the Tour. And they charged me 20 francs to enter the race!'

So I take it all back. Compared to the pros of yesteryear, we 21st century cyclists have it pathetically easy. But try telling the young people of today that, and they won't believe you...

Pete Muir, Editor

Hinault rode through a snowstorm to win the 244km Liège-Bastogne-Liège in 1980, getting frostbite in his fingers as a result. Now that's suffering on a bike



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All the stuff that makes you glad to be a cyclist



Leadout Pinarello K8-S



he jagged cobbles of Paris-Roubaix have inspired some very creative thinking among frame manufacturers over the years.

In the early 1990s, Greg LeMond took to the cobbles with newly conceived RockShox front fork suspension. A few years later, in 1994. Bianchi took things further with a fullsuspension frame. A decade after that Trek developed the SPA rear suspension system, putting a shock absorber in the wishbone at the top of the seatstays, an idea which lasted for a season or two. Then in 2012, Trek released the Domane, with the IsoSpeed decoupler, a pivot system that means that the seat tube can move independently of the rest of the frame.

So far, the Domane is the only survivor in the battle for a viable road bike suspension system (of sorts) - that is, unless the Pinarello Dogma K8-S can change the game.

Pinarello's solution to the severity of the cobbles is reminiscent of Trek's original SPA system, as well as the more recent YBB system from titanium brand Moots, but the engineering behind it suggests there has been plenty of original thinking along the way.

'This isn't the first true suspension system available on a road bike, but it is the first UCI approved,' says Massimo Poloniato, R&D engineer at Pinarello. 'We didn't collaborate with anyone from the mountain bike world. We collaborated with Jaquar Land Rover and its experts in suspension and vibration damping.

Pinarello's DSS 1.0 suspension unit includes a rubbery elastomer within a cylindrical sleeve at the top of the seatstays that can pivot at the point where it joins the seat tube. A few quick attempts at deflection in the Cyclist office showed that the suspension unit does allow considerable movement - easily deforming 5-10mm simply by shoving down hard on the saddle. That's while using the maximum preload setting, which can be adjusted using a basic lock ring tool to lessen or increase the level of suspension. Pinarello claims

that the frame has compliance to allow 9mm of vertical movement at the rear wheel.

The position of the suspension may intrigue some, because historically some suspension systems for road bikes have focused on the front of the bike rather than the back. 'Usually on rough terrain pro riders move their weight onto the rear wheel, unloading the front wheel,' Poloniato says. 'Following this consideration we chose to work on the rear of the bike - in this way we could maintain the Dogma's handling quality."

The front end of the frame has also been adjusted, though, but only with more conventional methods. 'On the front triangle. following the experience with the old Dogma, we decided to revise the head tube angle and the fork rake,' says Poloniato.

The K8-S was not conceived solely for the ruthless pavé of the Paris-Roubaix. Rather, the bike has a broader remit as Pinarello's comfort endurance bike for all terrains - akin to the Trek Domane or Specialized Roubaix. As such,



Pinarello has tried to keep the overall weight of the K8-S down, including the DSS 1.0 unit.

'The weight of the raw [unpainted] frame in medium size with the suspension is 990g. We consider that this bike is not intended only for the pavé but offers more comfort on all surfaces, including standard roads,' Poloniato says. Cyclist weighed the full bike (size 54) at 7.42kg, and we reckon that with a change of wheels there's every reason to believe it could drop to the UCI minimum weight of 6.8kg.

Given Pinarello's recent leaning towards increasingly stiff fibres, the K8-S seems to be a viable solution to the inevitable discomfort that rigidity can bring. 'The current road bikes are getting stiffer and stiffer and the result is a lack of comfort,' Poloniato confirms. But the design has not been as simple as just inserting a suspension system into a ready-made Dogma F8.

The carbon lay-up has been reconceived to allow for the new flex in the system, something that took a full year of development using the F8 as the starting point. 'The chainstays must keep the same lateral stiffness of our current bike to preserve the power transfer and in the meantime they must allow a vertical displacement to make the suspension work properly,' Poloniato says. 'The tube shapes have changed, especially at the rear. We also revised the carbon lay-up to get that 9mm of travel on rear wheel safely.'

With cobbles on the menu at this year's Tour de France, Chris Froome will no doubt be thankful for anything that can get him past Stage 4 unscathed, but only time will tell if the Pinarello Dogma K8-S will pave the way for a new generation of road bikes with suspension, or become just another blip on the timeline of tried-and-rejected solutions to cobble comfort. Pinarello Dogma K8-S, £tbc, yellow-limited.com



Ale Crono Grenada skinsuit

£155, paligap.cc

With their lack of pockets and a fit so tight they're almost indecent, skinsuits are generally the preserve of time-trial riders – but their aero benefits won't have gone unnoticed by KOM-baggers on Strava. Each panel of Ale's Crono skinsuit uses a different type of fabric, with a breathable mesh on the arms, a wicking material on the inner thigh and a fast, smooth fabric on the back and front. For some time-triallists, the most impressive feature will be the in-built relief channel within the chamois, to prevent too much pressure on nerves and bloodflow.



is a key facet of riding comfort, power and long-term health.

The Power saddle is a hybrid of the Sitero time-trial saddle and Romin road saddle, and Specialized boasts that it's the best for bloodflow. That's achieved partly by limiting

wider 168mm option at the lower 'expert' tier.

Our first impression is that the saddle is comfortable, even in the most aggressive positions. It could be the answer for those riders who want power without risking their chances of procreation.



Vittoria Qurano 46 tubular wheels

£1,199, fisheroutdoor.co.uk Graphene is the new super-material that's set to revolutionise the bike world (read all about it on p75). It's a form of carbon that's incredibly light, strong and heat-resistant, and its applications will be far-reaching - just as soon as the scientists have learned how best to implement its use.

It may be early days for graphene, but that hasn't stopped Vittoria using it in its latest Qurano tubular wheels. Available in rim depths of 46mm (rear, 42mm front), 60mm or 84mm, the Qurano wheels incorporate graphene 'nano-platelets' just a few atoms thick in the epoxy resin that binds the carbon fibre structure of the wheel rims. The results, according to Vittoria, are stronger spoke holes, 30% improved lateral stiffness of the rim, and better heat dissipation to protect the carbon fibre from heat damage under extreme braking.

These Qurano 46 wheels weigh 1,298g, making them lighter and significantly cheaper than the likes of Zipp's 303 Firecrest tubulars or Mavic's Cosmic Carbone 40 tubulars, and we'll let you know what we think once we've tested them. A Qurano clincher is in development, too.

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Jet Smart Glasses

madison.co.uk

displays the performance metrics,

notifications and live GPS maps only when glanced at, so Jet users aren't distracted the rest of the time,' says William Parry of Recon Instruments. 'The Jet obtains data both from its built-in sensor suite - which includes an accelerometer, gyroscope, magnetometer, pressure sensor and GPS – and from third-party ANT+ sensors.'

is controlled by a tiny button on the arm of the glasses. The software also allows third-party developers to contribute apps such as Refuel, a nutrition app that notifies the athlete when to consume food or water.

On test, opinion was divided over the Robocop look, and the screen takes getting used to, but the Recon Jets are an exciting glimpse of the future of data displays.



Speedplay Aero cleats

£59.99, i-ride.co.uk Because Speedplay's unique 'lollipop' design places the retention mechanism in the cleat instead of the pedal, it's always been quite a bulky, unsightly affair under the shoe that makes walking tricky, as well as being prone to collecting dirt.

The new Aero cleat tackles all these issues. The rubberised covers make for a slicker style (with some token aero dimples too) and the additional 'Cleat Buddies' inserts make walking easier while keeping out unwelcome grime. If they're good enough for Wiggo to break the Hour record, they're good enough for us.



Rapha Team Sky Training Kit

£85 jersey, £160 bibshorts, £15 socks, rapha.cc As kit sponsor to Team Sky, Rapha must listen to what its pros want. Riders can't spend every riding moment wearing the most pared-down, minimalist race kit - they occasionally need something more practical, and that's what this Training Kit aims to deliver. Essentially, it's still high-performance gear, but with additional comfort and safety features added for those long sessions that might stretch into the dusk hours. Those features include bright colours with some tasteful reflective detailing and a top-of-the-range padded insert for the shorts. Now we'll just wait for the arrival of the Rapha onesies.



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Garmin Vector 2

£1,199.99, madison.co.uk

After a lengthy delay launching its Vector pedals, Garmin has been quick to bring out a successor the aptly named Vector 2. Swift and hassle-free fitment is a priority, and there's a host of new dynamic metrics that means measuring power is just a tiny part of what these pedals are capable of. The latest software will reveal how you deliver your power throughout the pedal stroke, how much time you spend seated or standing during a ride and even where the centre of pressure occurs on your cleats (which may be helpful to bike fitters and for injury prevention). Basically, if you're into riding by the numbers you can generate enough bedtime reading to keep you up for a week.

What hasn't changed is that the Vector 2 is based on the highly popular Look Keo pedal platform and, unlike some competitors, requires no recalibration or adjustment for weather conditions. It will connect with any ANT+ head unit but works best with Garmin's own 1000, 810 and 510 models - the 1000 being the best choice if you want visuals of the plethora of metrics the Vector has to offer.





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Rochelle Gilmore

The Wiggle Honda manager and leading light of the UCI Women's Working Group talks about her team, the future of women's cycling and how to win a marshmallow-eating contest

Words MARC ABBOTT Photography LIZ SEABROOK

Cyclist: Wiggle Honda has had a pretty successful season so far. Is it fair to say everything is going to plan?

Rochelle Gilmore: It's been amazing. We knew it was always a risk having so many strong riders in the one team. We needed some time for the athletes to get to know each other, and to work out each other's strengths, mentally and physically. Now the team all really understand each other and I think we've got something really special.

Cyc: How does your own career as a pro cyclist help you to manage a team?

RG: Being one of the team's riders to start with, being in the peloton, being among the riders and understanding them helps massively. I still go out riding with them, and I'm still seen as a rider by lots of the girls. I can be their friend and training partner. Being a rider and a manager is something that lots of people criticised at the time, but I think it works.

Cyc: How do you cope with being both a friend and a boss?

RG: It's difficult, but I think the positives outweigh the negatives. I think if you asked the riders if they wanted a boss who was their friend, they would. They all want their boss to know what's going on, and I think having one of the riders managing the team and making the decisions has worked really well. They also need to know what upsets me, as a boss, and because they know me on a personal level, they don't take it totally personally when I have to get tough. They understand my expectations.

Cyc: How difficult have you found it to attract sponsors to women's cycling?

RG: Right now, it's not hard at all. Keeping one is more difficult for a lot of teams, because a lot of them aren't business-minded people - they're either male ex-pros or they've created an environment to give their daughter

2013 8th overall, Women's World Cup 2011 1st, Jayco Bay Classic 2010 Commonwealth Games Road Race Champion 2009 2 stage wins, Tour of New Zealand 2007 Oceania Games Road Race Champion 2005 1st. Geelong Women's World Cup, Oceania Games Points Race

Nationality: Australian

Age: 33

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2003 1 stage win, Giro the key to teaching these people coming to the sport how to give sponsors a return on their investment.

or girlfriend an opportunity. Education is

Cyc: With Wiggle Honda specifically, what are the targets for the team?

RG: I'd love to see Giorgia Bronzini win another World Championship [she won in 2010 and 2011]. She's so driven she's every part the professional in the way she conducts herself on and off the bike, in her relationships and dealing with sponsors. She's changed her mentality a little bit - she knows she's coming towards the end of her career and she wants to give something back to the other riders in the team.

Cyc: The 2015 team seems the most well rounded yet. Would you agree you have all bases covered?

RG: Three of our new signings - Mara Abbott, Elisa Longo Borghini and Joliene 🗘



D'hoore – offer something extra. Elisa is such an all-rounder that she could be world number one in a couple of years Ishe won this year's Tour of Flanders for Women], Mara is a pure climber and Joliene is just so strong in the Classicstype races. We have a bit of everything in the team, which obviously gives us more opportunity to win more races.

Cyc: What effect did the departure of Laura Trott and Joanna Rowsell have at the end of last year?

RG: I think the hole they left has been filled by new talent, and our partners weren't too surprised. British Cycling wanted them both to come into the team for two years to get stronger as part of the four-year cycle of the Olympics. We were there to help Laura and Joanna develop their strength. They returned to the track, rode bigger gears and got stronger. People forget how young Laura is. Now is going to be the toughest time for her career. She went straight to the top, and she needs to be comfortable she's giving 100% to win gold in Rio. She loved being in our team and she achieved her goals. Maybe if she does her thing in Rio and wants to come back to the team after, we'll see...

Cyc: Brian Cookson has said that a minimum wage for women pro cyclists would be counterproductive. Why would that be?

RG: I think if we focus on getting the maximum TV coverage for women's cycling, the sport will develop. People will be able to see it, sponsors will be

more attracted, athletes will become more expensive because they're on TV. At that point, teams will naturally pay them more. We need to get the sport to a level where it makes sense to do it, not because it's a regulation.

Cyc: Will equal prize money therefore go hand-in-hand with better wages?

RG: We'll reach that point eventually. To start with, organisers have to struggle with the logistics of adding a women's race to the calendar, in conjunction with the men's races. And they're doing that because they can see the value in it, not because there's a regulation. ASO want to put on the women's Tour of Qatar, a Tour de France event... and they're doing that because they see that value.

Cvc: You sit on the Women's Working Group that helps shape the future of the sport. What changes are on the cards?

RG: There will be a women's WorldTour for next year. It will be more attractive for broadcasters, and bring in more investment. It's going to be the most prestigious series for women's cycling - anything from 30-40 race days. They'll include some of the current World Cups, one-day races, Classics and the better women's tours.

Cyc: Does this mean new races?

RG: There have been talks with ASO, which puts on the Tour de France, about organising a women's Vuelta. And also talks with Ghent-Wevelgem about putting their race into the women's tour, so it's pretty exciting times for the sport. Gilmore believes UCI president Brian Cookson is really behind women's cvclina: 'He's put together a group in the UCI that's responsible for women's cycling. and things are changing rapidly'

'People forget how young Laura Trott is. Now is going to be the toughest time for her. She went straight to the top, and she needs to be comfortable she's giving 100% to win gold in Rio'

Cyc: In light of the 'bottom pinching' poster for Flanders' E3 Harelbeke race, would you say sexism is a problem?

RG: I think when something like that happens there's so much attention drawn to it. But women's cycling is growing in such a way that there's respect for it. We can't control what a marketing campaign does. But I think that when people see the hard work we put in as a team, the sport is gaining more respect than can be damaged by an advertisement like the E3 poster.

Cyc: Which one thing would you change in women's cycling right now?

RG: The things I wanted to change have already been done. The UCI has control and they're gathering information from teams, riders, sponsors, organisers and broadcasters. It's creating a sustainable business and a future. It was frustrating that it had that power for 10 years and did nothing, but now Brian Cookson has come in, he's put together a group in the UCI that's responsible for women's cycling, and things are changing rapidly.

Cyc: There was talk at your team's 2015 launch of a competition to find who could fit the most marshmallows in their mouth. You won, but how many did you get in there?

RG: Six. And they were pretty big. I reckoned we'd get 10 in, no trouble, but as soon as I got one in I knew I wouldn't come close. Yes, I won, and Dani King came second, but she was cheating because she was using her fingers to push them into the side of her cheeks... \$





Show your colours

Not every item of branded cycling clothing has to have performance benefits

Words SAM CHALLIS Photography HENRY CARTER



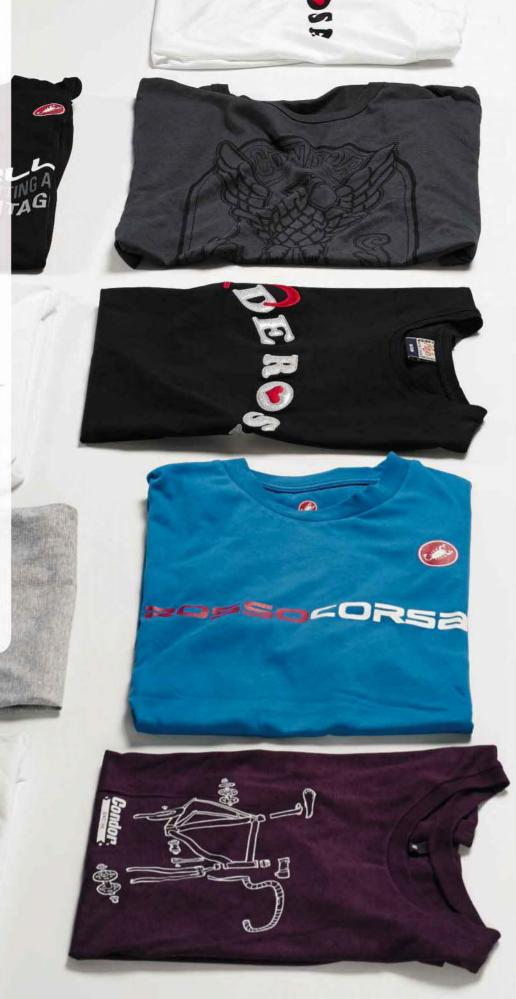
kinsuits can save watts, jerseys can be breathable, but the humble T-shirt has little function other than to be comfortable and say

something about the wearer.

The relationship between riders and the brands they choose is often an intimate one, so it's good to see that the big names in the bike industry have taken the time and effort to design stylish, subtle T-shirts that their customers will be happy to wear in noncycling situations without simply looking like walking billboards.

So whether your allegiance is to Campy or Sram, or you want the world to know that you're a Bianchi sort of person, there's a simple way of showing your colours without having to turn up to the pub in full Lycra.

For stockists see p208











Big hill or little hills?

Is a single big mountain ascent more punishing than numerous shorter climbs if the total distance and elevation remain the same?

Words IAMES WITTS Illustrations ROB MILTON



f you've got a long ride coming up – a sportive, perhaps – then what would be your preferred route profile? Maybe you'd like it to go over a climb such as the

Col d'Aubisque, a regular of the Tour de France, which averages a mere 4.2% but weaves its way towards the sky for 29.2km? Or maybe you would prefer something more like the Ardennes Classics, such as the Amstel Gold race, which features 33 categorised climbs, the majority of which are short, sharp and punchy?

Put another way, if two rides are 100km in distance with 2,000m of total ascent, but the two profiles are very different – one looks like a saw blade, the other has just one big hill – is one profile harder than the other to ride?

Everything is equal

'If the average gradient, total distance and metres climbed are the same, and you elicit

equal effort, it would balance out completely,' says Professor Louis Passfield, head of sport and exercise sciences at Kent University and former lead scientist at British Cycling. 'Essentially you've made the courses identical.'

So if there's no difference between those variables, it seems obvious that you'll expend the same amount of energy and take the same amount of time regardless of which route you ride. Not so fast, says Passfield: 'Key to this question is pacing, but we know cyclists, even world-class ones, aren't skilled at this. We did some mathematical modelling of riding an undulating course in a time-trial and asked the cyclists to control their power output to what we considered a perfect strategy – and they couldn't do it. They simply found it too difficult to hold back on power on the climbs.'

Even if you keep one eye constantly on your power meter, the chances are you won't be able to maintain consistent power outputs over the

course of the ride. The reason primarily comes down to cyclists' urge to beast themselves.

To explain, Passfield suggests we ignore the hills for a moment in order 'to simplify the question', and instead consider a comparison between a 10-mile time-trial and 10 one-mile efforts with easy recovery.

'It's a similar physical profile to the hills,' he says. 'As long as fitness allowed, you would push harder on the one-mile efforts, recovering between, than you would in a continuous effort. Yes, the metabolic cost of the intervals would be higher but so would the speed. Breaking the distance into chunks might also be more palatable mentally.'

So, according to Passfield, most riders would tend to tackle the Classics-style course – multiple small hills – at a faster pace and with greater effort than a route featuring a single, long big hill. But then it might depend on what kind of rider you are. •



There are three main forces a rider must overcome to project the bike forwards. The first is rolling resistance, the energy lost at the wheels through deformation and deflection of the tyre, which is responsible for a loss of about 2-5 watts of power. The second is air resistance, which is affected by the size of a rider's frontal area, as well as temperature, humidity and speed of the air. The third is gravity, which measures 9.8m/s2. These three forces are represented by possibly our alltime favourite equation: P = krMs + kaAsv2d+ giMs. Simply put, that's the power required to overcome these forces taking into account further factors such as the rider and bike's mass.

Forces of nature

Why does this matter when assessing the two route profiles? 'It's all down to absolute power, power-to-weight ratio and gravity,' says David Bailey, sports scientist at BMC Racing. Let's say you have a 75kg rider and his absolute power is 400 watts. His power-to-weight is 5.3 watts/ kg. A 60kg rider whose absolute power is 350 watts has a power-to-weight of 5.8 watts/kg. For a time, the extra absolute power of the 75kg rider will make him faster, even when the road starts to head upwards. 'However, once the gradient tips over 4-5%, your power-to-weight ratio becomes more important,' says Bailey.

At a constant speed, required power increases proportionally with the gradient. Taking our equation and placing the results on a graph, the lighter rider will start at a similar point to the heavier rider but will increasingly

'If someone like André Greipel trained on the hills every day he might get stronger, but would he win a climbing stage? No – he doesn't have the genetic blueprint'

distance himself from the heavier rider as the gradient increases. Does this mean the lighter rider should prefer a steeper profile, and the heavier rider a shallower one? Maybe not...

'Muscle type makes a difference,' says Bailey. 'A guy who has a prevalence of fast-twitch muscle fibres can generate high amounts of power in short periods of time, so might perceive the shorter, sharper climbs as more pleasant. Of course, these fibres fatique faster but they'd have recovery time between climbs. A rider packed with slow-twitchers might "enjoy" the long, shallower climbs."

Without taking Contador and Froome's muscle biopsy, we can only speculate what the ideal composition of slow-twitch to fasttwitch muscle fibres is for each profile. We can, however, be a touch more exact when it comes to fuelling our rides.

The respiratory exchange ratio (RER) measures the ratio between carbon dioxide produced and oxygen consumed in one breath. With this ratio, you can calculate which fuel the body is burning to produce energy. An RER of 0.7 indicates that fat is the predominant source of fuel; 1.0 is carbohydrate.

'I've had tests on the bike that have shown my fat metabolism is quite high,' says Trek Factory Racing's Bauke Mollema, who finished sixth at the 2013 Tour de France. 'When riding,

other riders started to burn carbohydrate for energy while I was still solely on fat."

In short, Mollema could cycle at a similarly high intensity to his contemporaries but fuel himself on fat over carbs. As 1kg of fat contains 7,800kcals and the body can only store around 400g of carbs (1,600kcals), the higher the intensity at which you can burn fat the better, allowing you to preserve precious glycogen stores for sprints and breakaways.

'Out of the two profiles, I prefer the longer, shallower climb,' adds Mollema. Which makes sense as Mollema is still heavily metabolising fat at this lower-intensity but longer profile. It begs the question: can you manipulate your metabolism to burn more fat?

'It's a hot topic at the moment, and it's why some riders do glycogen-depleted sessions,' says Bailey. 'But while training on low carbs is OK for losing weight, it hasn't been proven to actually improve performance."

Training your body specifically for either of the profiles would be of greater value but, as Bailey says, 'If someone like André Greipel trained on the hills every day he might become stronger, but would he win a climbing stage? No - he doesn't have the genetic blueprint.'

Greipel may not be a Quintana but his extra mass means he has a potential advantage on the descents. In fact, surely a longer descent would be conquered faster by both riders than a series of shorter descents, which require more

'Unless the shorter descents are only 30 seconds, I doubt there would be much difference,' says Bailey, 'The main effect would be time spent not pedalling [recovering], which might be negligible. The simple fact is that cycling 100km and climbing 2,000m will always favour the lighter rider."

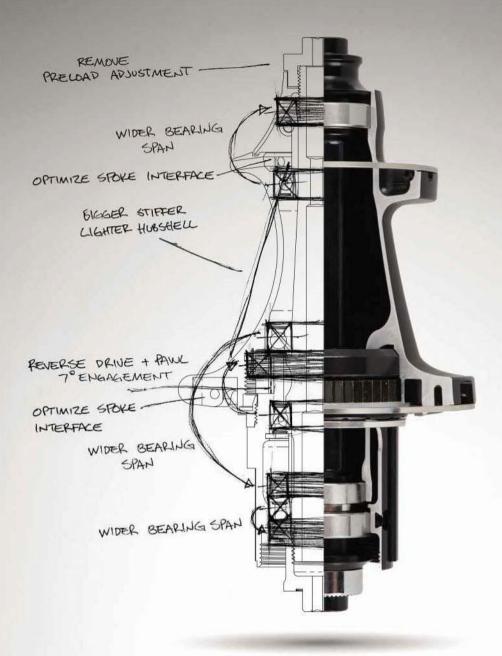




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Tour of Austria

If you think there's only one cycling race worth watching in July, you should spare some time for this nine-day festival of hills and hot tubs Words ELLIS BACON Photography MARIO STIEHL



t wasn't always the alternative to the Tour de France. The Tour of Austria used to be held in June and was

considered a tough, mountainous race at which many of the Tour de France favourites would fine-tune themselves. Only in 2005 did its spot on the cycling calendar change to make it the biggest race that runs concurrently with La Grande Boucle.

'It's easy to see how, if you were preparing for the Tour, it would have been a great race to go to,' Team Sky's Peter Kennaugh tells Cyclist. But since the race moved to its current July slot, and having been overlooked for a Tour de France place last year, Kennaugh made the race his own in 2014, winning the opening stage, and then, with the help of his Sky team, defending the lead all the way to the end. O

The details

What Tour of Austria

When Saturday 4th July - Sunday 12th July 2015

Where Vienna to Bregenz, Austria Distance 1,471km (over nine stages) First held 1949 2014 winner Peter Kennaugh (GBR)





Above: The Tour of Austria can attract big names who don't make the Tour de France – Ivan Basso took part in 2014

> Left: The peloton streams across a bridge on Stage 1 before hitting the open road (top)



The views are stunning. Think *The Sound Of Music* and you're not far off. Except the hills, in this case, are alive with the sound of grunting

'The race has got tough, high altitude climbs like the Grossglockner, which I'd actually climbed before at the 2011 Giro d'Italia,' says Kennaugh. 'It's a race that suits me, with a lot of climbing. Every stage last year had at least a few climbs even the sprint days had a few.

There's more praise from the Manxman for the organisation of the race, for the quality of the roads, and for the passion of the spectators watching at the side of the road.

'On that first stage that I won, the fans at the top of the climb were amazing. Good memories!' he smiles.

The race nevertheless remains something of a hidden gem. Save for the very occasional foray into Austria's mountains by other races (June's Tour of Switzerland had a stage finish in Sölden, for example) the Tour of Austria has what pretty much amounts to a monopoly on some of the world's finest mountain roads for cycling.

And the views are simply stunning. Salzburg might not feature on the route this year (the closest the race goes is Grieskirchen, for the finish of Stage 2), but think The Sound Of Music and you're not far off. Except the hills, in this case, are alive with the sound of grunting.

Still, there's always the post-stage recovery to enjoy, and Kennaugh reveals that one of his favourite things about the race was to take full advantage of the facilities at the teams' hotels.

'I remember going to some really nice saunas and steam rooms after some of the stages.' Eat your heart out, Tour de France. These Austrian hotels,

Kennaugh says, 'are all different. They all have their own character' - a world away from the generic, identi-rooms most riders stay in while riding the biggest bike race in the world.

No second-bests

In its own right, then, the Tour of Austria is almost perfect. But the unique aspect of the race is that a number of riders are there because they weren't picked for their teams' nine-man Tour de France squads. That means they're champing at the bit, which in turn suggests that this is a race as hard-fought as any of the 'bigger' ones for the simple reason that the riders here are generally on excellent form, with a point to prove.

Not that Kennaugh felt he had to prove anything, he says, although he was in great form, and very keen to show off the white-red-and-bluestriped British Road Race Champion's jersey he'd won the week before.

'There probably are quite a lot of riders there trying to get results for themselves, perhaps having worked for their team leaders up until then,' Kennaugh says. 'Then there are the top Austrian teams who, like the domestic teams at, say, the Tour of California, are trying to prove themselves. Everyone wants to get in a breakaway, so the racing's always "full gas". It makes for a really open style of racing, which can sometimes turn out to be harder than some of the more controlled racing you get in the ProTour.'

The Tour of Austria started life as an amateur race in 1949, when it was won O







Watching brief

See it on TV (or a laptop)

In the UK, neither of the 'big two' for cycling - Eurosport and ITV4 are set to show the race, but you might be able to find TV coverage on the internet. All above-board feeds, we mean.

For those who speak German, the Tour of Austria website's 'Live-Ticker' (oesterreichrundfahrt.at) is the place to follow the daily goings-on of your new favourite race.

Best bits

The stage up to the Kitzbüheler Horn – Stage 6 – which also goes over the Grossglockner earlier in the day should be a corker. It falls on a Friday, so locals will be doing everything to ensure they get off work early for this one, as the 2015 race will surely be decided here.

Who to put your money on

There's no Sky team here this year, so a repeat win by Peter Kennaugh is out of the question. Last year, Spain's Javier Moreno of Movistar pushed Kennaugh the closest, finishing as runner-up just over a minute slower than the British champion.

Like Moreno, Colombian climber and Tour de France favourite Nairo Quintana's younger brother, Dayer, also rides for the Movistar team, and finished ninth overall at the 2014 Tour of Austria, but won what was arguably the toughest stage the third stage to the Kitzbüheler Horn, in horrific weather – to prove his own calibre as a climber.

The Movistar outfit is awash with talent, and they are going to have some disappointed riders who don't make the Tour de France squad – making them the team to watch in Austria. Keep your eye out, too, for a good price on any other big-name riders who have missed out on the Tour de France.



The day to look out for is Stage 6, which goes over Austria's highest climb, the Grossglockner, and finishes atop the 12.9% Kitzbüheler Horn

by Austria's own Richard Menapace, and only became a pro event in 1996, won by the late Frank Vandenbroucke of Belgium. Its development has continued apace, however, and today it's ranked as a 2.HC race, one level below the top-tier UCI WorldTour events.

The 2015 race kicks off with a 5.3km team time-trial in Vienna, and ends in Bregenz eight days later on the eastern edge of Lake Constance. In between, the day to look out for is Stage 6, which goes over the Grossglockner and finishes atop the Kitzbüheler Horn, climbs that are both regularly used by the race – with good reason.

At 2,504m, the Grossglockner is Austria's highest climb, so it's only right that the race navigates its slopes, as it has done almost every year since its 1949 inception. It's very much celebrated by the organisers: the first rider across the summit earns the title of Glocknerkönig - the King of the Glockner - and takes home a rather tidy €2,500 (£1,800) purse for their efforts.

The Kitzbüheler Horn can't compete on elevation with the Grossglockner, but it's a whole lot steeper. The serpentine nature of the road up the Glockner keeps the gradients relatively shallow - its altitude is its selling point - but the route up the Kitzbüheler is Austria's steepest road: just shy of 10km in length, with an average gradient of 12.9%, maxing out at a quite ridiculous 22.5% near the top.

Tour of duty

Kennaugh, of course, is hoping for another call-up to the Tour de France, which he last rode in 2013, riding in successful support of Chris Froome. But if he misses out, he won't be in Austria: 'It's not on Sky's race programme this year. I don't know why not.'

It might be a case of 'so long, farewell, auf wiedersehen, goodbye' to Kennaugh's Tour of Austria title, but if you follow the action and results this year, this hard-fought, mountainous race might become one of your new favourite things.









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Worth your salt

We're always being told to avoid it, but salt is essential – especially for riders

Words MICHAEL DONLEVY Photography HENRY CARTER



t was Nelson Mandela who said, 'Let there be work, bread, water and salt for all.' It's perhaps not one of

his most famous quotes but it does highlight the importance of the mineral to our very existence.

Adding salt to food gets bad press, but the substance itself is essential. The sodium chloride it contains helps nerves and muscles function (important for living, let alone riding a bike) and it plays a crucial role in regulating the body's fluid balance. The problem comes, as so often is the case, when you have too much.

'Most people in the western world eat too much salt, particularly because it's present in processed foods to add flavour,' says Andy Blow, co-founder of Precision Hydration (myh2pro.com). 'Like most things, an excess on a chronic level is bad for you, but whether it's

as bad for you as has been made out is open to debate.'

'There's been a lot of negative press about salt,' agrees Mayur Ranchordas, senior lecturer in sport and exercise nutrition and physiology at Sheffield Hallam University. 'But sodium helps push water into the cells so it's actually essential for keeping you hydrated.'

NHS guidelines suggest that adults should consume no more than 2,400mg of sodium, or 6g of table salt, a day. The World Health Organisation recommends no more than 5g of salt a day. But neither of them take cycling into account.

'It's the mineral you lose most of when you sweat,' says Blow, who offers a quick science lesson: 'There are three different types of body fluid. There's intracellular fluid, which as you'd expect is in the body's cells. Then there are two types of extracellular fluid: interstitial, around the cells, and intravascular, which

is in the bloodstream, and is where sweat comes from. It's drawn into the capillaries and to the sweat glands, from where it is excreted to the skin.'

Not so crystal clear

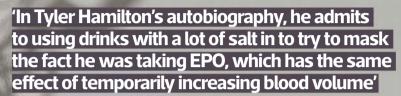
'The problem, when it comes to deciding how much salt you need to consume, is that everyone sweats different amounts, at varying rates, with different sweat composition,' Blow says. 'What works for me probably won't work for you. It's like giving 100 people your reading glasses to see if they work for them. They might be OK for one or two people but not for the vast majority.'

You certainly don't want to overdo it.
'Most people don't need additional salt
unless they're doing lots of training in a
really hot or humid environment,' says
Ranchordas. 'You can identify if you're
what's known as a "salty sweater" in
two ways: firstly, does your sweat

Salt is essential for regulating fluid balance, and it needs to be topped up because we lose it when we sweat. The key is having it as part of a healthy diet.







taste of salt? Secondly, if you train in black kit do you get white stains on it once you've finished riding?'

If you do, you should increase your intake. But how much to consume is largely guesswork unless you have your sweat rates analysed by a company such as Precision Hydration (look out for a test of this in our Lab Rat section in the near future).

'As a guide, if you're riding for two hours in hot conditions you can add a pinch of salt to cordial or squash,' says Ranchordas. 'Plus most sports drinks and energy gels contain sodium these days. Isotonic drinks contain similar amounts of sugar and salt as the human body, and they are the quickest way of absorbing what you've lost during exercise. Cyclists suffer from more sweat evaporation than most other sports because you can be on the bike for hours at a time. And if you're indoors on a turbo you may be sweating a lot too, even in winter.'

'The body is clever, and has mechanisms for regulating salt intake,' says Blow. 'You're unlikely to overdo it if you have a little extra on days when you're riding, as long as you don't have extra on your days off. If you have a little too much, the body will pee it out."

You can take salt on board during or after a ride, in the latter case by adding a pinch to your next meal, but there is also an argument for having it before you get on the bike. 'Sodium pre-loading gives you extra salt in your bloodstream, which increases blood plasma,' says Blow. 'If you read Tyler Hamilton's autobiography, he admits to using drinks with a lot of salt in to try to mask the fact he was taking EPO, which has the same effect of temporarily increasing blood volume. This is an aggressive strategy that you shouldn't use all the time but

it can help in long, hot races where the intensity is high and you may not get the chance to drink much. I've tried it and found it beneficial, but I've also tried it and got it wrong, and ended up with an upset stomach.'

Feel the pressure

That brings us to the downsides of having too much salt. 'It's been linked with hypertension - high blood pressure,' says Ranchordas. 'It's tricky ground. If you're healthy and active, having more than the recommended 6g of sodium per day probably won't hurt you, but some scientists say it does."

'The evidence is mixed,' Blow agrees. 'Studies in Asia found that in people with a high salt but low processed food diet there was no evidence of hypertension. The mechanism is there for it to cause high blood pressure, but it doesn't tell the whole story. A lot of it is down to poor diet and a lack of activity."

As well as gastric distress, excess salt can also lead to bloating and weight gain as your body retains fluid, but the positives outweigh the negatives if you don't overdo it, because there's another area in which sodium is believed to have a benefit, 'There's speculation about the role electrolytes play in helping to avoid muscle cramping, and it's another controversial area,' says Blow. 'Some people don't believe it but I think electrolyte deficiency has got something to do with muscle cramps, because there's so much evidence of people cramping more in hot weather. There's a link to muscle contraction, and the wrong electrolyte balance can throw your muscles out of whack.'

The advice would appear to be that a grind of salt on your dinner isn't going to be a problem - as long as your regular dinner isn't a microwave ready meal.













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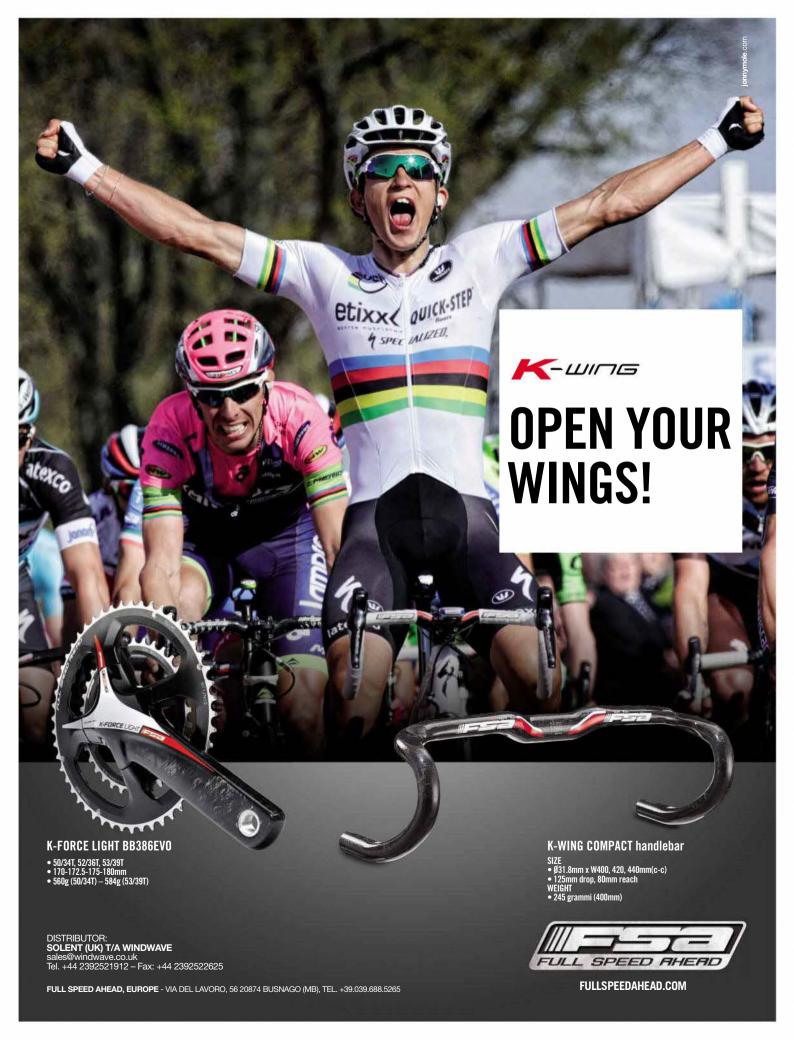


















Pedalling facts

Turning the pedals on your bike doesn't require a lot of thought, but as Cyclist discovers, maybe it should

Words PETER STUART Photography LIZ SEABROOK



hen it comes to technique, cyclists don't have a great deal to worry about. Compared to swimming,

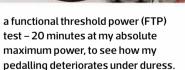
weightlifting or gymnastics, our sport requires the simplest of movements rotating a pedal. But while it may be an easy skill to perform, it turns out that it's astoundingly difficult to do well.

To investigate the process I've come to Personal Bikefit (personalbikefit.com) in west London. Here I'll be put through my paces on a Wattbike to analyse what's happening during my pedal stroke and how much power is being generated at each part of the rotation.

'People always think we're looking for problems with pedalling technique, but really we're out to find extra wattage,' says Spencer Wilson, owner of Personal Bikefit. 'Any kink in the pedalling profile represents a spot where watts are sitting waiting to be used.' With a focus on optimising power rather than addressing any aches and pains, we start the session with

away on a Wattbike, a graph displays the balance of the pedal stroke (above). The further out the line is from the centre, the higher the power output at that part of is a figure of eight, power is concentrated too much in the middle ideal is a sausage (or velodrome) shape

As Cyclist works the stroke. If the shape of the downstroke. The



I know the FTP will be a real strainer, and I approach it tentatively. Ahead of me is a giant LED screen relaying my pedalling output, along with vital statistics such as power and heart rate. I approach the first five minutes conservatively, trying to keep my technique consistent. Once five minutes pass, the numbers are looking good and Wilson is shouting encouragement, so I push up to 350 watts.

With 13 minutes on the clock, I put my head down and begin to push for home. Glancing up from my sweaty misery, I notice my pedalling graph is deteriorating, but in my effort to maintain intensity there's not much I can do about it. It looks like I'm heading for a personal best in the FTP test, so push on and finish with an average of 349 watts. I notice Wilson smiling, but not because he's in any way impressed with my performance - rather he is contemplating the flaws that have shown up in my pedalling technique.

'Have you ever done an asymmetrical sport?' Wilson asks. Indeed I have, as my youth was spent rowing on stroke side – to the right. My pedalling reflects this precisely, with my body slumping to the right and consequently giving my left leg a more rounded and powerful stroke. That's the simple part. Then we get into the real data.

From peanut to sausage

The analysis of the pedal stroke boils down to a few key indicators, the first of which is the angle at which the pedal stroke reaches its peak power. While O





the recovery,' Wilson says. 'The active muscles of a downward stroke are big engines - the quads and glutes. They work together with gravity to make an extremely positive driving action. Pulling up you have hamstring and hip flexor working against gravity - it's not efficient at all and leads quickly to fatique.' However, there still needs to be a dynamic movement during the recovery, but it's more about 'unloading' the pedal during the upstroke rather than lifting it, to simply take the weight off the pedal while the other leg drives.

The upstroke doesn't seem to be a big problem for me, though. My problem, according to the graph, is an imbalance of my peak power angle, which is a healthy 116° past vertical on my left leg but a measly 102° on my right leg. It's a stark imbalance, and it goes 🗘

there's no 'right' way to deliver power, and hence no specific angle that's correct for a peak power output, Wilson indicates that anything in the range of 115°-125° past vertical indicates an effective pedal stroke. Many newcomers hit peak power at as little as 90° past vertical (ie, when the crank arm is horizontal), indicating that they are probably pushing down on the pedals only vertically, rather than smoothing out the pedal stroke. 'Our aim is that you deliver the power as early as possible, but then generate that peak force as late as possible,' Wilson says.

Aside from the peak power angle, the spread of power between left and right leg is important, as is the shape of the power curve - the computer-generated image that indicates the efficiency of the pedal stroke.

'Wattbike calls the perfect curve a sausage, but I think velodrome is more apt,' Wilson says. The curve demonstrates how much force is being applied at any point of the pedal stroke - the further out the line is, the higher the level of power - and the angle of the curve shows where the power is being generated in the stroke. A very poor power curve will look like a figure eight, with the line returning to the middle of the graph when crossing the axis. This means that power is being produced only in the middle of the downstroke, and little technique is used to round off the pedal stroke in the recovery or

through the bottom of the drive - which is done by pulling the heel back, or as coaches describe it, 'scraping mud off the bottom of your shoe'.

As technique improves, the graph eventually becomes a velodrome shape, meaning that there's a strong generation of power throughout the drive and also the correct technique during the recovery and through the top and bottom of the stroke.

'A big misconception is that you have to actually pull up on the pedal during



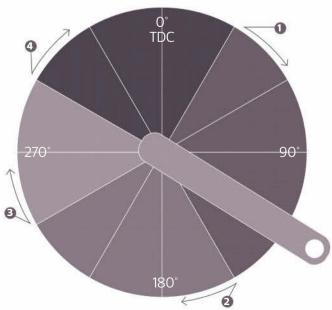
Smoothing the circle

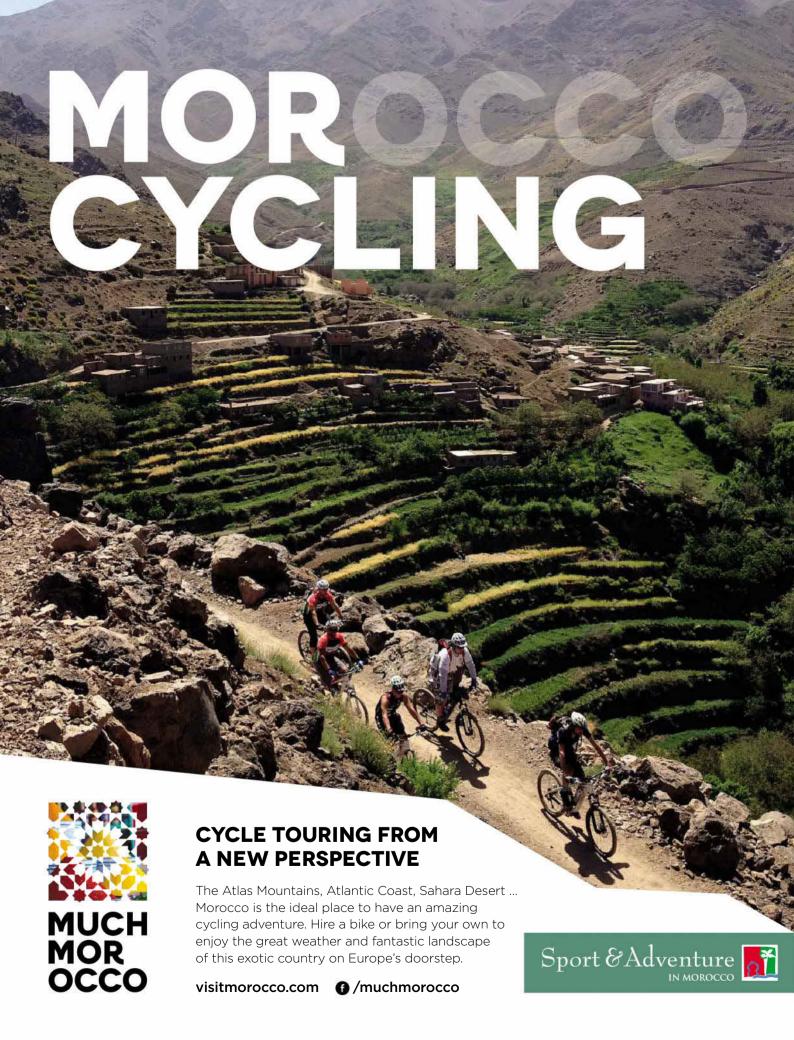
British Cycling coach Will Newton explains how to optimise your pedal stroke

- 1. Pushing down on the pedals comes naturally. You don't need to concentrate too much on this stage - just do it.
- 2. Through the bottom of the pedal stroke, imagine you're scraping mud off your shoe - pulling backwards.
- 3. Unweight your foot so that do don't lose any power, although actually pulling upwards gives only minimal benefits, if any. 4. Rather than just letting the pedal coast over the top, use an 'ankle flick'. Your toe should be pointing down (plantarflexion)
- initially, moving to a heel-down position (dorsiflexion) ready to get the power down soon after top dead centre (TDC).

Other drills for a smooth pedal stroke...

- As you go over TDC, pretend you're sliding your foot forwards into a shoe.
- Imagine you're turning a double-length crank and making big circles with your feet.
- Increase your cadence so you're happy pedalling smoothly at 100-120rpm.









hand in hand with a significant dip at the top of the graph, where my right pedal moves feebly over the top of the pedal stroke, sacrificing further watts.

I feel a little discouraged, but Wilson emphasises that it could be a great deal worse, and shows me some previous examples that look like tiny disorientated starfish to prove the point. For me, crucially, there's power to be gained. I think we could quite easily add another 10% to your FTP simply by making your pedalling more efficient,' Wilson says, to which my ears prick up with enthusiasm.

Stabilising the stroke

'You over-rely on your left oblique muscle,' Wilson says. 'That creates a pelvic lift and rotation. This in turn creates unstable pelvic balance and positioning, hence your angles of peak force.' The solution is to isolate the muscles that create the imbalance and try to strengthen them.

We head into the gym to go through some exercises, the first being a lateral leg raise. I'm stunned to see how difficult it is to simply raise my right leg to the side in a controlled way, when my left leg lifts freely. We work through a handful of other slightly humiliating exercises, including a side plank and single-leg straight-leg deadlift, which continue to show my gaping muscular imbalance. Already it's obvious how the lack of stability of my back and glutes has forced me to pedal in quite an unusual way - compensating for



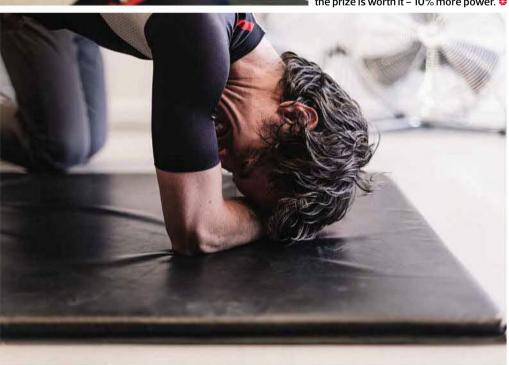
'We get some clients near perfection, but they have three weeks off the bike and ignore stretching, and we have to start over again'

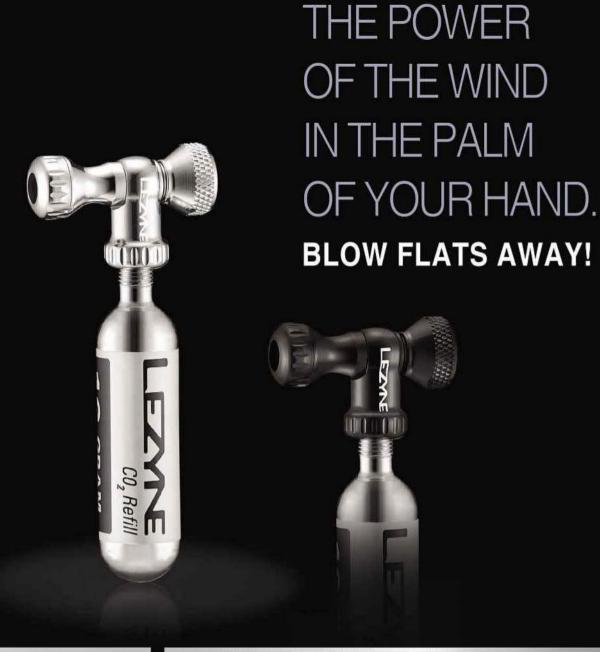
my imbalances to create what looks like a normal pedal stroke.

Returning to the Wattbike, I try to implement some of the changes to create a platform for my pedals to whir around smoothly. Encouragingly, my profile is beginning to flatten out, and look a little more like a velodrome than a peanut shell.

With the prospect of 10% more power there for the taking, I'm keen to tackle my bad habits, but Wilson makes clear that it's a long journey of stability exercises and stretching. 'This is 100% a matter of work in progress for almost every rider. We get some clients near perfection, but they have three weeks off the bike and ignore stretching, and we have to start over again,' Wilson says. 'Your body is naturally lazy and will always look for the easiest way out."

On my ride home I start to battle with my body's laziness, focusing on my technique and motivating myself to do my exercises every day. I realise this may turn into a protracted struggle, but the prize is worth it - 10% more power. \$\text{\$\text{\$}}





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Steering opinion

Stems come in many lengths and angles but it's more than just your riding position at stake if you want to make a change Words STUBOWERS Photography HENRY CARTER



ith lengths from as short as 40mm up to a whopping 150mm, plus an assortment of angles, bar diameters

and fitment sizes, the handlebar stem offers a lot of options for such a simple component. So how do you choose what's right for you?

Every bike fitter and frame builder Cyclist spoke to agrees that extremes of stem length and angle are often not ideal due to the effect they have on the way the bike handles. 'There's a direct link between the stem length and handling,' says Ronan Descy, cofounder of Fit and Find (fitandfind.com). 'It affects not only the arc through which the handlebars move, but also your weight distribution. Most of the way a rider engages with the front end comes from their weight distribution, so stem

length is vitally important, not just for fit. but for how the bike feels to ride.'

Measuring up

Determining the length of a stem is fairly simple - it's measured from the centre of the steerer tube to the centre of the handlebar - but the angle may be less clear. A 0° rise stem is essentially straight (at 90° to the steerer/head tube of the bike), although don't misinterpret this as being horizontal (parallel to the floor) because the steerer tube is not perpendicular to the ground, so a 0° stem will still in fact have a slight rise (usually +17° assuming a 73° head angle). Stems can usually be used either way up, and this is why stems are often referred to as, for example, +/- 6°. For the stem to be parallel to the ground it would need to be a -17° angle (if the head angle is 73°).

From top to bottom: Deda Elementi Zero 2 (70mm), £26.99, chickencycles.co.uk

> Ritchey WCS C220 (110mm), £77, paligap.cc

3T ARX II Team (150mm), £76.99, i-ride.co.uk

Overleaf, from top to bottom: PRO PLT Alloy (70mm), £44.99. madison.co.uk

> FSA K-FORCE Light Carbon (110mm), £173.95, windwave.co.uk

Zipp Service Course SL (140mm), £88, zipp.com The consensus among the experts we contacted is that 110mm (+/- 10mm) is an optimal length, with angles no greater than +/- 8° in order to achieve a 'neutral' feel on a road bike. Bas Schaapveld, product developer for PRO (Shimano's in-house component brand), says 100mm and 110mm are the most popular lengths for PRO's road stems. So why then do manufacturers even feel the need to make 140mm or longer stems with a -17° rise?

'The human form comes in many different shapes and sizes, so stem lengths and angles need to account for that, plus different levels of flexibility,' says PRO's Ben Hillsdon. 'Different stem angles and lengths help riders to find their preference between comfort and aerodynamics, and in addition the same stem won't always work for the same rider for eternity. As we get older and •











change shape, a different position on the bike might be necessary, which can be solved easily with a new stem and a new handlebar position.'

Rene Wiertz, president and CEO of component manufacturer 3T. savs. 'Obviously 140mm and 150mm aren't very popular, but we produce them because of demand from pro riders. It's a bell curve - the middle sizes are the most popular – but saving we only need 100-120mm stems for road bikes is like saying we only need 54-58cm frames. Yes, we'll always sell more 100mm stems than 50mm stems but the demand for the 50mm stems is easily high enough to justify making them.'

Jimmy Wilson, analyst for Londonbased bike fitters Cyclefit, suggests there might be another reason some riders opt for long stems: ego. 'Short stems look out of place on road bikes because we're used to seeing long stems on the bikes we covet - those used by pros. Some pros have specially made 150 or 160mm stems.' Which begs the question, why? Doesn't it mean they need a larger frame size?

'Really long stems are perhaps more to do with riders taking things to extremes because they can,' Wilson says. 'A low, stretched out position conforms to the norms of the peloton."

Pro riders like to get long and low on the bike to create a racy, aerodynamic position, but they have the flexibility and conditioning that allows them to maintain that extreme position, which is why weekend warriors should think twice about fitting a super-long stem, no matter how much they want to emulate their heroes.

The long and short of it

Vanity aside, the length of the stem can affect the way the bike steers. A shorter stem will elicit a more immediate effect due to the shorter turning arc, while a long stem reacts more slowly. But there's more to it than that.

'You want to have enough weight on the front wheel to keep things balanced,' says Descy. 'As the stem gets shorter you gradually un-weight the front wheel and that often leads to a feeling of a quicker - some might say twitchy - steering feel.'

Wilson agrees: 'A short stem [less than 90mm] can make the steering feel a bit too reactive, which can be alarming

at high speed.' But Descy adds, 'I think the word "twitchy" is overplayed. It's not as prevalent as you might think. Going down 10 or even 20mm in stem length isn't suddenly going to have a huge impact on steering leverage - and besides, we don't really turn the bars. We mostly lean the bike to steer. Also I believe at a subconscious level the body will quickly adapt to a different set-up.

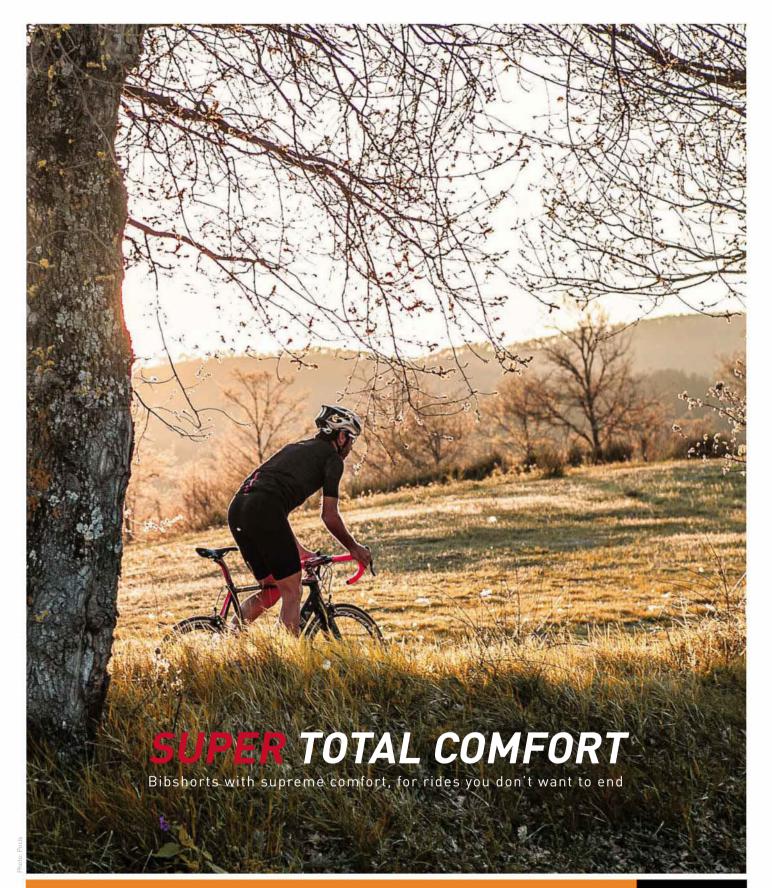
'Longer stems [120mm+] tend to start to feel a little sluggish in terms of the steering response, but have the added benefit of getting more weight on the front wheel, which is better for grip when cornering at speed,' he adds. 'Hence they're often favoured by racers, particularly crit racers. The optimum angle for me would be $+/-6^{\circ}$ to $+/-8^{\circ}$ and, as with length, as you move away from this optimum it's a sliding scale of influence on handling. The steeper the angle the more you have to lean to get the bike to react in the corners, ie there is a less immediate steering effect.'

To add to the complexity, how a bike handles isn't just down to steering input and weight balance. It's a combination of several other factors including head angle, wheelbase, fork rake, wheel size and tyre width.

One final consideration for stem length is that the longer the stem, the more likely it is to flex under powerful movements such as climbing or sprinting. Of course this can be prevented by investing in a particularly stiff stem. but Wilson reckons that issues of stem flex shouldn't be overplayed: 'Yes, stem stiffness matters, but only after you've stiffened up several other squidgy bits first. Frame, fork, front wheel, bars are probably worth doing ahead of the stem.'

Stems clearly play a pivotal (literally) role in the way your bike fits and handles, but it seems there's no simple formula to find the right length stem. A slammed, long stem may be handy when you're leaning at 30° through a tight corner in a crit but less crucial ambling through the lanes on a Sunday afternoon. What's clear is that the wide-ranging choices shouldn't be a substitute for a poorly fitting frame in the first place. If you're buying a new frame or even having one custom made then deciding on the stem length you would ideally like to use is an important consideration from the outset.







London steel

From jewellery maker to framebuilder, Caren Hartley is showing the boys how it's done Words SAM CHALLIS Photography FRED MACGREGOR



think it is on the rise as more people get into cycling. There has definitely been a revival in the industry

which will hopefully continue to translate into more work.'

About 18 months ago, Caren Hartley recognised the resurgence in interest for custom steel framebuilding, so she decided to put her career as a jeweller and metal sculptor on hold and turn her hand to building steel bike frames. It's a move that has paid off quickly, with an award at this year's Bespoked Handmade Bicycle Show.

'It was really to do with just loving cycling,' says Hartley. 'I was already doing metalwork, my jewellery and sculpture, and I decided I didn't really want to do that anymore. I still wanted to work with metal, so it was kind of a eureka moment when I realised that perhaps I could make bikes and maybe do more cycling.' Good to her word, when Cyclist visits her workshop in south London, Hartley has just returned from a two-week cycling trip in the south of France, riding on a bike she built for herself.

Having studied at the Surrey Institute of Art and Design and then the Royal College of Art, Hartley gained an advanced understanding of metalwork. Her education and subsequent career proved invaluable when it came to building bike frames.

'The skill set is really similar,' she says. 'Obviously it has been a massive learning curve, but the basic techniques are pretty comparable. For example, •





'I was doing metalwork, jewellery and sculpture, and I decided I didn't really want to do that anymore. I still wanted to work with metal, so it was kind of a eureka moment when I realised I could make bikes'



'I suppose it's the jeweller in me. Most important is the finishing and the attention to detail the details that aren't too obvious, so it's kind of a secret between you and your bike'

components still need to meet absolutely perfectly, so the scale is different but the attention to detail and making things fit is really similar.'

Hartley gained the experience necessary to make the transition from jeweller and sculptor to framebuilder by working at Saffron Frameworks, another London-based bike builder, and by helping out Jake Rusby of Rusby Cycles, with whom she now shares a workshop.

'Then I did a course at the Bicycle Academy, which was my first full bikebuilding experience. Since then it has just been part teaching myself, and asking Jake lots of questions."

This combination of tuition and self-education has certainly proved effective, as Hartley's bikes display distinctive styling and flawless finishing. 'I suppose it's the jeweller in me,' she says. 'Most important is the finishing and the attention to detail - the details that aren't too obvious, so it's kind of a secret between you and your bike. The silver detailing is something I'm putting on all of my frames, and I like painting contrasting dropouts, which is what I have been doing on all of the frames so far.

'On every frame I try to do something, even if it's just a flash of colour,' Hartley adds. 'It helps set off the main colour and is something I will try to continue doing. I think of aesthetics and function as equal. It has to function O





Hartley's career as a ieweller meant she already had many of the skills - and the eye for detail - required to build steel bikes







perfectly, but if it doesn't look good I'm not really interested.'

Of course, secret details and contrasting dropouts aren't the only things that set Hartley apart as a framebuilder. She is well aware that the number of women making bike frames in this country (or any other. for that matter) is tiny, but she doesn't feel that this has been an obstacle, or made it any harder to prove herself in a male-dominated world.

'Maybe 10 years ago it might have been an issue, but most people are more interested in the building of the bike. They are often also interested in my opinion as a smaller rider.' Geometry on smaller frames has to be carefully thought out to negate clearance issues, and having had first-hand experience of both riding and building smaller frames, Hartley relishes the problem-solving involved with her work.

It wasn't a small bike that helped her scoop an award at Bespoked, but a fat one - or at least a chubby one. Hartley's 'Porkeur' bike, built from Reynolds 931

stainless steel, with disc brakes, a front rack and clearance for wide tyres, won the award for Best Utility Bicycle.

'That award has really helped. It has given me a bit of recognition so people aren't worried about me being new any more,' she says. With the business now established, Hartley is eyeing future expansion and hopes one day to be able to take on extra help, to give an aspiring framebuilder the same opportunities she received.

'Right now however I want to build it slowly and get really good at what I am doing,' she says. 'I find the whole process so satisfying, but the best thing is when I meet the customers and the people at the shows who are really interested in what I'm doing. They're people that just love their bikes and are really enthusiastic about my work, which is really nice.'

Is there any part of the process she doesn't enjoy? Hartley laughs and says without hesitation, 'Polishing.' To find out more, go to hartleycycles.com







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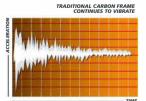
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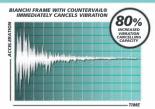
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In praise of... leg shaving

lexander the Great

encouraged his soldiers

Should road cyclists shave their legs? Of course! But determining why and how is a little trickier Words TREVOR WARD Photography DANNY BIRD

to shave off their beards and keep their hair cropped so that the enemy wouldn't have anything easy to grab hold of during close-quarter combat. Ancient Egyptians favoured sleek, hairless skin to prevent the spread of lice and other follicular infestations. And the Romans kept their skin smooth to denote they were from the higher, educated classes.

So cyclists can hardly claim to have invented the art of shaving their extremities for strategic purposes. What is surprising, however, is that cyclists were shaving their legs long before most women had adopted the practice as a social norm. Photographs from as far back as the 1920s show riders sporting hair-free legs, while it didn't catch on with women in the general population until Betty Grable exposing her satin-smooth pins in 1943 coincided with a worldwide shortage of nylons.

What's so strange?

So my regular practice of reclining in a bath with a Philishave razor and a can of Satin Care shave gel is actually not as vain or indulgent as it might first appear. What may strike some as strange, however, are my reasons for doing it.

It's not to make me go faster – there are simpler, far more effective ways of decreasing my drag coefficient on the bike. Like forgoing that extra Weetabix at breakfast, for example.

It's not to make my post-ride massage easier to apply – as an impecunious non-professional, I can rarely afford the luxury of a massage, and when I do it's usually self-administered with a rolling pin.

It's not to speed up the healing process after crashing. I don't actually crash that often. If I did – to the extent that the hairiness of my legs was a critical factor in how efficiently and quickly I healed – I'd probably consider taking up a different sport. Like chess.

According to a couple of experts I spoke to, there are actually good reasons to keep my legs hairy.
Consultant dermatologist and regular cyclist Professor Philip Harrison says leg hair 'provides sensory input, for proprioceptive purposes. In other words, it aids our sense of feeling and positioning when active, thereby enhancing balance. Furthermore, leg hair has a sweat-wicking function, which will help to a slight degree in temperature regulation.'

Dr Susan Mayou, a consultant dermatologist at London's Cadogan Clinic, says leg hairs can also provide insulation: 'In the cold, the *arrector pili* muscles [bundles of smooth muscle fibres attached to the deep part of the hair follicles] make the hairs stand on end to trap the air between them, which is a form of insulation.'

And yet clean-shaven legs have been a fixture of the professional peloton even longer than derailleur gears.

Too sexy for my legs

Gerald Ciolek, winner of the 2013 Milan-San Remo and pro rider for MTN-Qhubeka, says that as well as reducing the risk of infection and helping wounds heal quicker, 'it's simply a "done thing" in cycling. It just looks better. Plus the ladies find it sexy.'

His teammate, Johann van Zyl, is even more forthright: 'It looks cool, it feels cool and it makes me feel faster. If I stopped racing tomorrow, I would still shave my legs. Any recreational rider should cut off that leg hair or avoid Lycra – the two don't mix well.'

This confirms my suspicion that a lot of leg-shaving is less to do with science, and more to do with image. Leg muscles that have been finely toned through hours on the road look so much more impressive when not sheathed in hairs. If you've got it, flaunt it.





So, having pondered the subject for a while, here are my reasons for why I shave my legs...

It's a badge of honour – it marks me out as a cyclist, which I believe is something to be proud of. Other cyclists will recognise a kindred spirit, while non-cyclists will be left in no doubt about my commitment to the sport.

It's a tribute to the legends of my sport. When I'm in the bath taking a razor to my limbs, Coppi, Anquetil and the rest are in there with me. So to speak.

It makes applying sunscreen easier, although admittedly this isn't really an issue in Scotland where I live. As Billy Connolly observed, there are only two seasons up here: winter and July.

It just looks good. And as van Zyl says, looking good makes you 'feel faster'.

The hairy hot pants look

While pros regularly shave as high as their hips - which commonly bear the impact in crashes - the question of how high to go is often debated among us lesser mortals. Do you stop at the hemline of your shorts, creating a hairy hotpants look (or, as Cyclist columnist Frank Strack puts it, 'wookie shorts')? Or do you go 'all the way'? Dr Mayou advises caution: 'We all have bacteria on our skin, but around the upper thigh or groin you have a particular, natural flora - bugs - that can be a problem if you break the skin or shave upwards and open the follicle a bit more, turning it into a portal of entry for infection.'

As I'm digesting this grim scenario, she asks if I've considered waxing. She hears me wince and says, 'If us girls can live with the pain, it will be nothing for you macho cyclists. Plus it would make so much more sense. Waxing pulls the hair out by the root, so you have longer intervals between shaves. Surely in something like the Tour de France that's a good thing?'

I could see Jacques Anquetil waxing - probably while sipping champagne and flirting with the staff at his local beauty parlour - while Bernard Hinault probably took a rusty scythe to his legs.

The net result was the same, something that us amateur riders can rejoice in today - smooth, sculptured legs that announce unequivocally to the curious: I am a cyclist.

I shave, therefore I am. 🏶







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Milking it

One of Britain's most iconic races has found new life in Nottingham Words MARK BAILEY

Photography ALEX WRIGHT



f cycling's unique appeal emanates from its accessibility – with fans able to feel closer to the action and their idols than those who follow football, rugby and

cricket – then the Milk Race has always been the ultimate expression of the sport's allure. At the 2015 edition of the historic race, which took place on a Nottingham city centre circuit on May 24th, fans saw double Olympic track champion Laura Trott warming up on rollers in front of a branch of Dorothy Perkins, 2014 team pursuit champion Katie Archibald getting ready for battle beneath an empty bus stop, and two-time Olympic track champion Ed Clancy blasting past Primark and Costa. Riders and fans have always enjoyed an intimate bond at Britain's most nostalgic race.

The Milk Race has enjoyed a colourful history since its inception in 1958. Its origins can be traced back to the day a semi-pro rider from Derby called Dave Orford asked Reg Pugh, the publicity officer of the Milk Marketing Board, which was a sales monopoly for dairy farmers in England and Wales, to help sponsor riders. Pugh, eager to advertise milk's healthy qualities, decided he'd rather sponsor a full race and so the Milk Race was born.

Thanks for the memories

Originally a week-long stage race, the event is ingrained in the folklore of British cycling. Shots of grinning riders wearing white, red and blue caps and guzzling pints of milk are memorable images from the race's history. Cyclist has witnessed iconic cycling figures such as Team Sky performance boss Rod Ellingworth and former world champion Rob Hayles get misty-eyed at the mere mention of the race. Current British Cycling technical director Shane Sutton won the event himself in 1990.

'People remember it because it toured the country – you either loved watching the race or you probably remember your journey being interrupted by it,' says race director Tony Doyle, who won the world pursuit title in 1980 and 1986. 'It has huge popularity and is fondly remembered. Riders of a certain age say, "Yeah, I remember watching it with my mum and dad when it came to Brighton."

Between 1960 and 1984 the race was limited to amateurs, but pros were permitted from 1985. Then in 1993 disaster struck. A change in EU laws neutralised the power of the (now defunct) Milk Marketing Board and the race was disbanded. The week-long British stage race morphed into what •





Above: Nottingham town centre attracted a crowd of 100,000 – nearly double that of two years ago – and the spectators weren't disappointed with the action

Left: Traditional milk bottles hark back to the race's glory days of the 1980s



is now known as the Tour of Britain, and the Milk Race became a fading memory, 'It left a huge hole in British cycling,' says Doyle. 'But then cycling grew from a minor to a major sport, so I approached the Dairy Council and we planned the race's return in 2013 as an annual one-day crit in Nottingham. The city has a strong cycling heritage - Raleigh is a local brand and it has hosted lots of big races. We could bring the race to the public, and that was the key appeal of the original race.'

Dani King and Felix English won the first of the new races in 2013, with Katie Archibald and Graham Briggs triumphing in 2014. Crowds have grown from 60,000 in 2013 to 100,000 this year. Fans can enjoy cycling skills shows, family rides on the circuit and bike stalls, but the main appeal is the frenzied men's and women's elite races, which proudly offer equal prize money.

'It is still a very iconic race,' says Sandy Wilkie, chairman of The Dairy Council. 'The original sponsorship lasted over 30 years, which makes it one of the longest-running associations in British sport. Even current pros know about it because their coaches talk about it. Laura Trott, Dani King and Ed Clancy have all watched YouTube videos of the old Milk Race and read stories about it.'

The 2015 race took place on a 1.2km circuit, with riders racing up Long Row, around Beast Market Hill, down Friar Lane and Spaniel Row, across Castle Gate, past Nottingham Castle, before returning to the Old Market Square, up Lister Gate, across St Peter's Gate, along Bridlesmith Gate and back down Long Row to the finish line. The women

'Even current pros know about it. Laura Trott, Dani King and Ed Clancy have all watched YouTube videos of the old Milk Race'

raced for 50 minutes plus five laps, while the men competed for one hour plus five laps.

In the men's race, 2009 British national road race champion Kristian House of JLT-Condor beat Andy Tennant of Team Wiggins in a sprint finish, with House's teammate Ed Clancy third. House and Tennant reeled in a breakaway and counterattacked on the climb back into the city centre and powered away for an epic 40-minute long, two-man breakaway.

'Typically I'd have gone for the sprint sooner,' says House, 'but I knew he would know that as we've raced together a lot over the years! So I thought I'd surprise him by waiting. The atmosphere was incredible and the crowd was behind us all day. The Milk Race has always been very highly thought of but I think the new format is great. If you want to get non-cycling people interested in the sport, •











Above: Fans get close to the action on the narrowest and tightest sections of the route

Above right: Women's race winner Laura Trott downs a celebratory pint









The women's race was even more dramatic, with Trott defeating Archibald by just three hundredths of a second

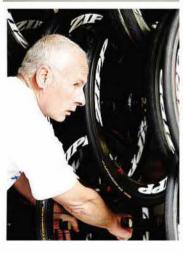
these races are perfect because they are short and fast and things are always changing."

The women's race was even more dramatic, with Trott defeating Archibald by just three hundredths of a second. A mortified Archibald dropped her head in despair when she saw the photo finish appear on the big screen.

'I thought Katie had rolled me so it wasn't until they announced it over the Tannoy that I knew,' said Trott, who later admitted that she can down a pint of milk in 16 seconds. 'It was the other way around last year so I was pleased this time I managed to turn it around. There were so many people out there once again. It's great to see, especially for women's cycling - that's what it needs.'

Doyle believes the appeal of this revitalised race remains strong. 'What is special is the history and the heritage,' he says. 'You might not be a football fan but you know the FA Cup Final at Wembley is special. In the same way cycling fans will always be impressed and enthralled by the Milk Race.' 🟶 For more information go to themilkrace.com







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The next carbon fibre

It was discovered from a pencil smudge on a page, but could graphene be the new super-material that transforms the bike industry? Words MAX GLASKIN Photography DANNY BIRD

n the face of it, graphene is a simple material. It's a single layer of carbon atoms 0.3 nanometres thick - a million times thinner than the paper

of this magazine. Yet it's 150 times stronger than steel and 20% more elastic. It conducts electricity better than copper or gold, at a speed of one million metres per second. It sheds heat fast. It's transparent as well as totally impermeable, and it should have the same impact in the 21st century that carbon fibre did in the 20th and steel in the 19th. No wonder the two materials scientists at Manchester University who discovered it in 2003. Andre Geim and Konstantin Novoselov, were fasttracked to a Nobel Prize and knighthoods. But what does this have to do with bikes?

Graphene's early adopters

The first cycling products containing graphene are starting to hit the market. Vittoria uses graphene in its latest carbon Qurano rims (see p20) and Catlike too uses it in its range-topping Mixino helmet. Custom carbon framebuilder Richard Craddock of Craddock Cycles says, 'There's a lot of excitement about graphene right now, but these are only the first forays. Like every new material, its full potential isn't yet known but it's most likely the maximum benefit is not as a substitute for carbon but as an enhancement. I'd use it when it's proven.'

Paul Wiper, research associate at the National Graphene Institute at Manchester University, says, 'Graphene can improve the mechanical properties of a composite, as it can share the strain when added to the epoxy resin matrix and make it stiffer. You have to get the balance right, though. A lot of graphene, say 10 or 20% of the matrix, would make it really stiff but it would also be brittle.'

His colleagues are currently perfecting the use of graphene in composite frames for aerospace, and Spanish car manufacturer Spania already includes it in its GTA supercar chassis. So could bicycle frames be next? 'There's no reason at all why it couldn't be used in bike frames and I'm sure someone's working on them already,' Wiper predicts.

Vittoria has such faith in graphene, it's put its money where its mouth is. 'I happened to have dinner five years ago with the founder of Directa Plus, one of the first graphene factories in Europe, and I came up with the idea of using graphene in our products,' says Vittoria president Rudie Campagne. 'Then we decided to invest in them, to be at the cutting edge.'

Vittoria claims by using graphene in the new Qurano carbon wheels it has increased spoke-hole strength and lateral stiffness of the rim by up to 30%. But above all, Campagne enthuses, 'The improved heat dissipation of graphene reduces the accumulated temperature of the rim [under braking], keeping it well below the threshold where carbon fibre would start to disintegrate.'

Adding graphene to carbon is not quite as simple as adding sugar to your coffee, though. Directa Plus supplies graphene to Vittoria as 'nano-platelets', which are just three to seven atoms thick. 'The big challenge was to achieve a near-perfect dispersion of graphene in the master batch of epoxy resin for the prepreg carbon sheets,' says Campagne.

Slice of inspiration

'People had speculated for decades that graphene existed within allotropes of carbon materials such as graphite, coal and diamond, but nobody had known how to make it as a single two-dimensional layer,' says Wiper. In an inspired moment, Geim and Novoselov had started with a smudge of crystalline graphite effectively a pencil mark - which is composed of multiple, stacked layers of graphene, and using sticky tape they stripped away some of the graphite. Being curious, they did it again and again, until finally they isolated a single layer pure graphene. Then they tested it.

'Usually when you make materials thinner and thinner, their properties deteriorate,' says 🗘



• Geim himself. 'But with graphene we found things only got better.'

Labs around the world now make graphene in many ways, with different purities, varying sample sizes and batch quantities. For example, Catlike says it uses nano-fibres to maintain the strength of its Mixino helmets, which are now 10g lighter than previous models. Others are using it in the form of nano-ribbons, and Samsung and Sony claim to have invented ways to make continuous sheets. What is perhaps surprising, though, is that it's not overly expensive. You can buy a kilo of nano-platelets for less than £150.

As more versions of the material are created, it's certain that the use of the word 'graphene' in marketing material will create confusion for consumers. It will be tricky to ascertain whether a product that claims to be 'graphene-enhanced' really does contain the sub-microscopic material, or whether it's doing any good. It's a loophole the unscrupulous could exploit.

'A lab could test the material to see if it performs as claimed, but you'd have to do a chemical test to make sure graphene is present,' Wiper says. And as graphene exists within most forms of carbon, even coal dust, it could be Trades Description Act hell. But in the right hands, its promise for the cycling industry is vast.

Potential uses for graphene include preventing corrosion on exposed parts such as rims, chainrings and spokes, or, if embedded in carbon components, graphene nano-fibres could conduct electricity or even transfer data. That would reduce cabling for electronic shifting and bike computers. Alternatively it could form strain gauges in carbon hubs, cranks, pedals, chainrings or shoe soles, where its nano-fibres would reduce complexity and potentially cut the price of power meters.

Nano-diamonds have already been coated with graphene to create superlubricants, which could eliminate almost all friction from bearings, and super-bright, graphene-enhanced LEDs are promised as soon as next year. A graphene supercapacitor can potentially store more energy than any existing batteries, so therefore substantially lighter electronic shifting components would also be made possible. What's more, trials of embedding graphene electrodes in polypropylene fibres are underway too, so there's even some potential for future inclusion in clothing garments. It's hypothetical at this stage but there could be a point in time when your jersey and shorts become smart, sensing your heart rate, blood pressure, temperature, perspiration rate and even the activity of individual muscles. It really does seem like its uses and benefits have few bounds.

'Graphene is obviously so new that its applications are only just starting to be studied,' says Campagne. 'It will take many years of fundamental and applied study to come up with great new improvements of existing products or new applications and refinements. The journey is only just beginning.'







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The Makers Chris King at Chris King

Think headsets, think Chris King. Cyclist meets the man behind the eponymous legend Words JAMES SPENDER Photography GEORGE MARSHALL

> Cyclist: The current Chris King line-up encompasses everything from hubs to your resurrected frame brand, Cielo. What was the product that started it all?

Chris King: It was a headset, back in 1976. No. actually the first prototypes were probably in 1975.

Cyc: Out of all the parts of a bike to start manufacturing, what drew you to the headset?

CK: Well, I had a shop in the back of a small bike shop – it was the size of a garage – and there was this bunch of racers who hung out there that I used to ride with. One day one of them said, 'You know, if you're going to dink around making parts you should think about making a better headset.' I didn't even really know what a headset was, but he pointed it out to me and explained the pitfalls. In those days the best thing you could get for a headset was just a Campy road steel, which had no seals or anything, and was prone to coming loose and the bearings getting dimpled. I'd been working at a place that made surgical tools, and some of the devices they made

used bearings that were pretty much the size of a headset. They'd get them back from the field, all seized up, replace the bearings and put the old ones in the scrap bin. So I rummaged through and got a few bearings, put them through the ultrasonic clean and wow! These things were like new. Then all I had to do was fashion up some cups and figure out how to mount them. I made a bunch of prototypes and gave them out to the racers and they were all, 'Gee, these are really good, maybe you should make more and sell them.' OK. So I turned that bin over in the parking lot one morning and salvaged about 1,000 bearings, which kept me going for a couple of years.

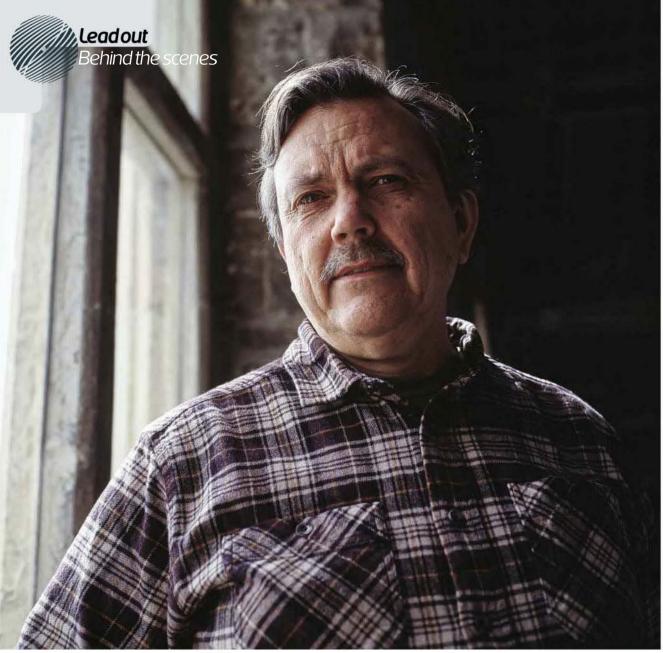
Cyc: Are any of those headsets sill going?

CK: I would assume that most of them are still in service today. Mostly on collectors' bikes, but every once in a while I see one. Two bearings per headset, so I must have made 500.

Cyc: How did you manage to turn those 500 headsets into the Chris King of today?

CK: In the phonebook my name was pretty near the top, and the two names above it never answered their phones, so when people wanted a prototype part made for them I usually got the call. That gave me the money and spare time to make bike parts. Up until the 80s, making headsets or bike parts was never more than 15-20% of my work. Then the mountain bike boom happened, and when guys crossed over from road they took my headsets with them, and they became a cult in MTB. At one point in the 90s, one magazine put us at 50% share of aftermarket headset sales, neck and neck with Shimano, and everyone else not even a percent. After a while I started to sell enough to make a living. O

Initially, tinkering with bikes was a hobby for Chris King: 'I'd been working at a place that made surgical tools, and some of the devices used bearings that were pretty much the size of a headset'



While no longer turning parts, King is still hands on at the company that bears his name: 'I'm still the biggest problem solver in the company - although that's probably because the biggest problems are always sent my way'

Cyc: Today Chris King is committed to producing products in as environmentally friendly a way as possible. Do you think we're in ethical good health across the industry?

CK: That's a loaded question! I think the bike industry in the last decade or so has headed off in the wrong direction, being driven much more for commercial and fashion reasons, encouraging turnover and obsolescence, and that just leads to waste, right? You're green to a certain point just by owning a bike - but it's a fallacy to think that you're not contributing to the overall waste in the world. Now it's all about rushing to get things to market, getting the jump on the next guy.

Cyc: Are there still brands out there that impress you, though? CK: I've always been impressed by Campagnolo – it was one

of my inspirations to begin with. A lot of its stuff is rebuildable, as you can get spare parts and even replace stuff like bushings in derailleurs. The same goes for high-end Shimano stuff.

Cyc: What do you see as useful innovations in the bike world?

CK: High-pressure clincher rims – I used to just ride tubs as it was the only option. They were cool, I love them, but when clinchers came to road that was real innovation. Clipless pedals, carbon bike forks, indexed shifting...

Cyc: How involved are you in Chris King now?

CK: I'd love to be retired, but I don't know if that's ever going to happen. I'm pretty integral still. Granted, I'm more of an administrator than I was in the past, but I'm still at all the engineering meetings every week, still the biggest problem solver in the company – although that's probably because the biggest problems are always sent my way. Everything flows uphill. I'm not turning parts, though, although I'd love to. It's therapeutic, cathartic you might say.

Cyc: Is it important for you to remain a US company?

CK: In the early '90s there was a big thing made about 'Made in the USA'. We were supposed to be the best. We could fly that flag, but I look at it from a global sensibility, I embrace quality wherever it's done responsibly. Do we have a floor filled with American-made CNC machines? Unfortunately not. We try to vote with our dollars and source things domestically, but it's getting harder.

Cyc: Are we in danger of losing manufacturing skills permanently to the Far East?

CK: We're absolutely in danger. The tide's been going that way for a long time. Will it ever come back? Absolutely O

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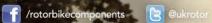
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BIKECOMPONENTS



'I saw a good finish as an inherent part of design. Aesthetics is respect for good design, but I still never saw myself as an aesthetics guy'

it could, but at the moment the pace of the industry and the buying public's consciousness means it's going that way. Great Britain is a good example of having lost much of its industrial capabilities. We had the recession of course, and that flushed out a lot of journeymen, forcing people into early retirement. They're not coming back, and they've taken their skills with them, skills that would normally be passed down to apprentices. The other big thing is factories got closed down, assets liquidated and equipment moved to Asia. To set those factories up again now would be prohibitively expensive. Even if we did move those machines back, who knows how to use them? Luckily where we are in Portland [Oregon] there's enough people still interested in manufacture to supply a small company like us. They work for us because they're proud of what they make, and we do our best to train people and keep things going. And you come to shows like this [Cyclist is interviewing King at the Bespoked bike show in Bristol] and you see quality manufacturing is there in the bike industry, and beginning to grow again.

Cyc: Do you ever think it's funny that your ethos is one of function over fashion, yet your components such as anodised hubs have come to be seen as the ultimate bike bling?

CK: The bling? Honestly that was just a secondary thing. Traditionally what's associated with a high-quality product is a high-quality appearance. If you're buying a Bentley you

don't expect it to have an orange-peel paintjob. I spent a fair amount of time in the medical industry, and medical devices had to be well finished for two reasons. One, they couldn't have sharp edges because if you cut the surgeon's hands you compromise the surgical theatre. And two, if doctors are going to buy your stuff they need it to look good – things evoke emotions and buying decisions aren't without some basis in emotion. But I just saw a good finish as an inherent part of design. Aesthetics is respect for good design, but I still never saw myself as an aesthetics guy. I'm a mechanical guy.

Cyc: With that in mind, it came to our attention recently that you were a massive part in the threadless headset revolution [see issue 34]. How did that come about?

CK: This guy John Rader had come up with an idea for a threadless headset and Dia Compe [latterly Cane Creek] wanted to make it. They came to me to make some prototypes, so I actually made the first threadless headsets for them. They wanted us because they wanted to have their idea recognised, to use my credibility. Overall it was a reasonable relationship, we benefitted from it, and they certainly made a lot of money out of it. And look how long we kept Shimano out of it! [At this point two fans interrupt and ask to have a picture taken with King – 'Your stuff will outlive me,' one says].

Cyc: Does that happen often?

CK: Ha! You know, here and there. It's not what I was looking for though. When I was doing contracting, oh my God, what a thankless industry. People haggling over a dime off this part or a nickel off that. With bike parts it's great, it comes with real appreciation from people. Wow. That's one of the things that's driven me all these years. People like what we do, and that's kept me in the bike industry. ******



King regrets that the shift to manufacturing to the Far East has drained the American bike industry of skills that were once commonplace: 'We do our best to train people and keep things going'

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I spy with my little Eye... GPS data from a smartphone, displayed on this neat gadget from 3T. It shows all the usual metrics, plus it neatly integrates into the 3T Arx II stem if you have one (stem not included).

2 VITTORIA CX BELT

£23.99, chickencycles.co.uk

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repurposed 320tpi tyre casing and can be worn at 200psi, making it perfect for holding up trousers during all-you-can-eat buffets.

3 SRAM XG-1180 **CASSETTE**

£246, sram.com

If a 32-tooth sprocket is the 'dinner plate of mercy', the 42-tooth on this Sram cassette is a veritable silver salver of absolution. Part of Sram's Force 1 1x11 speed drivetrain family, it covers most traditional

gear ratios without the need for a second chainring.

4 PARK TOOL IR-1 CABLE ROUTER

£49.99, madison.co.uk

Only two things really test one's sanity: other people's opinions and trying to thread cables through internally routed frames. Sadly, you'll never win over everyone, but you can make internal cable routing a breeze thanks to the Park Tool IR-1, which uses clips, magnets and

wires to solve your internally routed problems.

5 RAPHA B&O H6 HEADPHONES

£329, rapha.cc

For the cyclist who has everything, Rapha has teamed up with Bang & Olufsen to have the acclaimed H6 headphones re-trimmed in African hair sheep leather and Rapha's signature pink. According to sources, a merino-lined Smeq fridge and Siberian beaver hide iPad will be out later this year.

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When your number is up

In a dog-eat-dog world, your race number is the connection to your inner wolf. Or something like that

Dear Frank

What is the maximum amount of time allowed between finishing a race/sportive and removing your race number from the bike? Stuart, by email

Dear Stuart

As a species, humans have been promoted outside the food chain. That's ignoring the unfortunate few each year who actually get eaten by another animal when, for instance, they decide to go live with grizzly bears in Alaska. Which, by the way, is a better way to go than to wind up on some distracted driver's bumper. I'd rather get demoted back into the food chain than die in the idiot chain, given the choice.

Having achieved this amazing status in the animal kingdom, where we are the only species who hasn't the need to avoid a carnivorous predator while sipping a cappuccino on the way to the office, we have arrived at a state of existence where we stage an entire range of competitions in order to bring out the inherent survival instinct that lurks somewhere within each of us.

Never trust a Cyclist columnist on matters of history, but I am given to understand that 'sport' started more or less with the Greeks in Athens, who liked to have their winners live and their losers die. Later, in Rome, this same model generally held true, except the competitions often involved warriors fighting tigers and lions. In a way

those particular competitions saw humans reintroduced into the food chain. This was still better than whatever awaited them outside the Roman Empire, which, from what I've read, really sucked hard.

That was the trick to these early empires - life sucked so hard that all they had to do was suck a little less than everything else and there was no limit to what they could make people do on their behalf. That's how they built the aqueducts. Genius.

I'm not saying there isn't any hardship today. I am, however, trying to provide a little bit of perspective. We have no natural predator and have thus invented our own world of stress to allow us to nurture the inner fire that stokes any species' survival.

In modern sport, we have a tendency to use words like 'battle', even though we don't have to face some gold-plated, swordwielding maniac. In that sense, cycling isn't really that hard. But it feels that hard when we do it right, although it definitely doesn't have the same consequences, assuming that distracted driver doesn't come calling.

Cycling is a tough sport - the toughest, I might say. Racing is the hardest kind of cycling there is, and every one of us who does so should be proud that we voluntarily subject ourselves to such suffering when there is no evolutionary or social justification to do so. We do it for our own enjoyment. In a world of luxury, where we've evolved out of the food chain and into the rat race, I tip my hat to anyone who not only swings a leg over a top tube, but who ventures into the darkness of the pain cave and drops the flashlight not for the sake of their survival, but for the sake of their character.

And when it comes to character, there is no need for affirmation. The will comes from within. That race number is a memento to you and your effort, and it should be cherished. It is not there to tell others of what you have achieved, but to remind yourself of what you have accomplished. Keep that number close, where it will remind you of your strength when you need it most.

How long should you wait before removing the number from your bike? This, I cannot tell you. But I can tell you this: the number will lose its meaning with every ride you go on. Stow it away, keep it safe. It is for you alone. *



Frank Strack is the creator and curator of The Rules. For further illumination see velominati.com or find a copy of The Rules (Sceptre) in all good bookshops. Email your questions to him at cvclist@dennis.co.uk





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impressive due to their vast scale and dramatic geology, and then there are those that just seem to have an air of magic about them. This ride took us to one such place, the Gap of Dunloe, wedged between Ireland's highest mountains, with a narrow lace of asphalt threaded through an enchanted landscape of lush green grass, with pitch black boulders thumped into its surface. For this one place alone it would have been worth the visit, but we were treated to so much more besides.

Above: On the Ballagisheen Pass, Cyclist adopts the 'aim-for-the-sheepand-trust-that-it-willmove' approach

Previous pages: The Gap of Donloe is like a scene from a painting. The winding road and tough climb makes it perfect cycling territory

Choice location

When we were looking for the ideal location for a Big Ride in Ireland there was an abundance of choice. Killkenny, Wicklow, Cork, Mayo, Donegal... all of these counties overflow with the buckling mountains and empty roads that would provide a demanding physical challenge and a ripe scenic backdrop. What swung it for Kerry was the fact that it's about as far south-west as you can get in

the British Isles, reaching out into the Atlantic with broad fingers of inspiring landscape.

The route we've chosen is based loosely on the Ring of Kerry, a popular tourist pilgrimage around the coast of the Iveragh peninsula. We've adapted it to our own purposes, however, and created a bespoke version starting in Killarney and cutting south-west through the middle of the peninsula to take in two passes before rejoining the main 'Ring', and then diverting inland once more for a leg-testing and dramatic crescendo at the Gap of Dunloe.

Joining me on the ride today is Dan, a former Ironman triathlete with the powerful stature of a rouleur. He's going to be a useful ally on the long trawls into exposed headwinds, and he'll also push the pace on the hills, as I'm going to find out soon enough.

The morning is bright as we roll out of the friendly Killarney Court Hotel and pedal lazily through the town, stopping briefly at O'Sullivans cycle shop to make minor tweaks to the bikes and stock up on pocket snacks. Killarney has won recent awards for being Ireland's tidiest town, and it certainly seems on immaculate form as we pass through on our mid-week visit. We swivel our heads •





The landscape is rocky, with sheep nibbling on the uneven grassy hillsides and a patchwork of bracken, yellow gorse and heather decorating the verges



Ring-a-ring o' roadies

Follow Cyclist's route round the Ring of Kerry

To download the route, go to tinyurl.com/q9lnxo7. From Killarney centre, take the N72 Ring of Kerry road towards Killorglin for a couple of kilometres, before turning left onto Gap Road to Glencar. Stay on this road to New Chapel Cross, then turn left onto Seaview Terrace towards Waterville. Leave Waterville on the N70, taking the Ring of Kerry route through Caherdaniel to Sneem. Then leave the Ring of Kerry once more, turning left onto the R568, which takes the inland route towards Moll's Gap. Turn left signposted Black Valley Hostel towards the Gap of Dunloe, and follow that through the Gap onto Gap Road. Turn right once more onto the N72 and retrace your steps back to Killarney.









to see the striking St Mary's Cathedral, an impressive structure for a settlement of 14,000 inhabitants, on our way out of town on the main N72. After 6km on the flat we turn left onto Gap Road, and our adventure begins.

The road is named after the Gap of Dunloe, the jewel at the end of our route. For now we ride past the left turning that would take us to the Gap, and continue into the midst of rural Kerry. The road is narrow and quiet, and to our left looms the Macgillycuddy's Reeks mountain range, which stretches for 20km like a spine down the centre of the peninsula and includes Carrauntoohil, the highest peak in Ireland at 1,038m, as well as the second and third-highest peaks. We'll be seeing them up close in a few hours, but for now our attention is turned to our thighs, which are being called into serious action for the first time today.

We chose this region not least because of its undulating terrain, and soon we find ourselves on our first gentle climb to Lough Acoose. The landscape is rocky on both





The rider's ride

Moda Stretto, £2.699, moda-bikes.com

The Stretto sits second in Moda's range of carbon bikes below the rangetopping Finale, and it was a solid and lively performer on the varied Kerry terrain – more than a match for the sharp inclines and a rapid companion on the long, flat drag towards the Atlantic coast. The overtly monochrome design leaves little doubt as to the bike's racy intentions, and it responded with an uncompromising ride that rewarded out-of-the-saddle efforts, aided by the 7.43kg weight for the full build. Moda prides itself on its bikes being designed, assembled and tested in the UK, and the roads of Ireland served up a similar mix of smooth and rough surfaces as we'd find at home. If I'm being critical, the bike never imposed its character in any particularly exciting way. But after a 153km day in the saddle, it wasn't the Stretto that was finding its limits.



The scene evokes those classic pictures from Death Valley, but with green instead of parched earth on either side



The Iveragh peninsula offers dramatic views of the Kerry coastline w right: The statue of Steve 'Crusher' Casey guards his home

sides, with sheep nibbling on the uneven grassy hillsides and a patchwork of bracken, yellow gorse and heather decorating the verges. We're reminded that we're in the Emerald Isle by a hundred subtle shades of green, broken only by the grey strip of the asphalt in front of us. As we summit we pass Lough Acoose on our left, its tranquil waters reflecting the hills beyond it, while on the right the fluid landscape is contrasted by the simple geometry of electricity lines that accompany us for the next 10km.

Straight and narrow

After the first climb comes a refreshing descent through trees that opens out onto plains with hills in the distance. The road is narrow with that tell-tale grassy central strip that is both welcome as testament to the lack of traffic in these parts (we haven't seen a another vehicle for 20 minutes or more) but also demands unyielding attention as we pick up speed and lose altitude. Now we're faced with lacktriangle



our first magnificent vista of the day. As the landscape flattens, a pure green plain spreads out on all sides with the arrow-straight road disappearing to a vanishing point at the foot of the hills on the horizon. With yellow lines on either side of the tarmac, the scene evokes those classic pictures from Death Valley, but with green instead of parched earth on either side ('life valley' might be more appropriate), and the scale reduced by a factor of 10.

At the horizon will be our next climb - the Ballagisheen Pass, or Bealach Oisin, to give it its Irish name. It's 5km long, starting with a kilometre at 6% followed by a gentle 3km of around 3% that allows us to admire the green plains falling to our left and the rocky hills to our right. Then it kicks up to 11% for the last kilometre, with a steep righthand hairpin delivering us to the summit. We stop and take a moment to admire the stunning view back across the plain we've just traversed, and then begin a rapid descent that feels like a mirror image of the climb: steep at the top and becoming more gentle as the height drops away.

Having dispatched a couple of ascents on our journey to the coast, we feel like we're into the meat of the ride now, getting a feel for the mellow Kerry landscape.

The road is now flat and there's a slight headwind, so Dan and I fall into an unspoken through-and-off pattern, each taking our fair share of the work. Dan is a big unit, 6ft 4in and strong. I'm smaller and find my stints on the front tough, counting the pedal strokes and craving the O





The Ballagisheen Pass is 5km long, starting at 6%. Then it kicks up to 11% for the last kilometre, with a steep right-hand hairpin to the summit





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large hole in the air he's been punching. Even though we're sharing the load, I get the faint impression I'm trying harder than he is as we continue our pencil-straight journey across the heart of the peninsula. After 15km of this we reach the junction with the N70 (which is the true Ring of Kerry) and take a left towards Waterville with lunch on our minds.

Comedy central

A 'Yield' sign as we reach the edge of the town reminds us that we're not in the UK, and as we approach the sea front we see our lunch stop, the first in a row of brightly coloured houses that seem to be a feature of seaside resorts. The An Corcan restaurant is painted a deep shade of purple with yellow window surrounds, and this, combined with a cooking pot on the sign, exudes a welcoming air that chimes in perfect harmony with the rumbling in our stomachs. Dan and I look at each other with a 'this should do' expression and the decision has already been made. The cheeful exterior is matched in person as we're shown

to a cosy corner table. Our click-clacking Lycra entrance turns a few inquisitive heads from the silver-topped coach party tourists in the restaurant, but the staff are well used to cyclists and we're handed menus.

'What's the catch of the day?' I ask the waitress, keen for something fresh from the Atlantic, which is mere yards away. She pauses, looks pensive, and says, 'Usually, I think it's fish.'

I search for the glint in her eve, but she's completely deadpan, and says, 'I'll go and check for you.' Soon she returns from the kitchen to tell us it's sea trout.

We eat the generous portions quickly, and then fall into conversation with Fiona, the owner of An Corcan, She's curious about our ride, and when she finds out we're from Cyclist she's keen to tell us all about Waterville and the mass Ring of Kerry bike ride that takes place every July and draws more than 10,000 riders (see panel, right).

'Have you seen the Charlie Chaplin statue on the sea front yet?' she asks, before explaining that Chaplin and his family were annual visitors to Waterville for more • Above: The outlines of mountains soaring skyward are everywhere in Kerry, which means you're almost always climbing or descending

Following pages: The road around Moll's Gap showcases Kerry's green and rocky terrain to the full







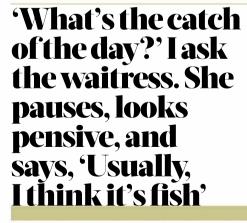
The Ring of Kerry The tourist trap with plenty of escape routes

The Ring of Kerry is one of Ireland's top tourist attractions, drawing cyclists, walkers and coach parties by the hundreds to the beautiful Iveragh peninsula.

Because the roads are narrow in places, and this being a popular tourist route, the coaches are required to drive only anticlockwise around the loop so that they don't get stuck, with cars encouraged to go the other way.

Each year there is a huge bike ride on the first Saturday of July where the roads are closed and thousands of riders (11,000 in 2014) register to ride the 180km route. The organisers claim that the event has raised more than €8.4 million to date (last year's event alone raising over €1.5 million).

While the official 'Ring' route is picturesque, there are many options for the visiting cyclist, which take you off the beaten track and away from the traffic and into some prime and challenging territory. The Gap of Dunloe is a must, although choosing that option cuts out the route through the Killarney National Park, which you might save for another day. Cutting north/south across the heart of the peninsula is the Ballaghbeama Gap, another barren and spectacular pass. So many options...











than 10 years, and the town took him to their hearts. In 2011 Chaplin's family gave the town its blessing to establish a Charlie Chaplin Comedy Film Festival in Waterville. 'And there was a Charlie Chaplin world record attempt here a few weeks ago for the most Charlie Chaplins in one place,' Fiona says. 'We got 159 and were 90 short of the record. The rules are very strict! They have to have black trousers, black moustache, black bowler hat, a cane... there's a long list and if you don't have it all you don't count.' There will be another attempt in August 2015 (chaplinfilmfestival. com/guinness-world-record-attempt).

Refreshed by lunch and a little local folklore, we saddle up again and head for our third climb of the day, which begins immediately as we leave Waterville. We're on the Ring of Kerry proper now, but the traffic isn't bad at all, and we start the dramatic ascent that traverses a huge green and rocky bank to our left, and offers a glorious unfolding view of Ballinskelligs Bay to our right.







Dan edges ahead again and I tell myself I'm more interested in the scenery, but actually the catch of the day seems to have weighed me down



and Cathedral, St Paul's Cathedral and the Paris Opera House, among other landmarks.

The descent from here shakes off the last of our lunchtime lethargy with bouts of flat-out pedalling and head-down coasting, and only gentle corners that demand attention but no braking. With the Atlantic to our right and the sun shimmering off the glistening surface, we're thankful that Ireland is treating us to a day of perfect sunshine.

As the road begins to flatten we flash past the popular beaches near Castlecove, and the road starts to climb gently once again as we head inland and towards Sneem.

Upping the ante

Dan edges ahead again and I tell myself I'm more interested in the scenery, but actually the catch of the day seems to have weighed me down and I'm labouring after 100km in the saddle with 50+ still to go. •

as I settle back and take the climb at a leisurely pace, marvelling at the epic views in the distance and the hedgerows of fuschias in full bloom on my left that stretch into the distance. At the top of the climb, though we've only been going for a few kilometres, we pull into the layby to take in the panoramic scenery. It's clearly a favourite stopping point for coach parties too, and there are a few stalls, including a man selling intricate paintings on slate, sourced, he tells us, from Valentia Island, which he points

out just a few kilometres north-west of here across the bay.

Dan is looking strong (again) and pushes ahead

Valentia Island is one of the most westerly points of Ireland and a popular diversion from the Ring of Kerry. Because of its prominent position in the Atlantic, it was the easterly station of the first viable transatlantic telegraph cable, a service that ran for 100 years until 1966. It's also famous for its slate, which was used to build the UK Houses of Parliament, Westminster Abbey

Above left: The descent through the Gap of Dunloe is technical – all the more so with 140km in the legs

By the numbers

Things make more sense when uou can count them

Kilometres ridden

Times Cyclist failed to gap Dan on the climb towards Moll's Gap



Pieces of litter we saw in Killarney

Pony and traps passed at the Gap of Dunloe



Charlie Chaplin bronze statue seen in Waterville



• We descend into the small town of Sneem, named after the river that flows under its bridges to the nearby estuary, and we're greeted by more cheerfully colourful houses that beckon us to a halt for a refreshment stop. In the middle of the town we see our second bronze statue of the day, this time Steve 'The Crusher' Casey, a five-time world champion wrestler born in Sneem who emigrated to the US to further his career. Dressed just in (bronze) wrestling shorts, we suspect that he doesn't inspire quite as many lookie-likey record attempts as Waterville's adopted hero.

Here we leave the official Ring route and head inland once more, the road climbing again and rewarding us with a complete view of the Macgillycuddy's Reeks, this time from the other side. Dan eases ahead again, putting a couple of hundred metres between us, and as he moves towards the horizon I feel an involuntary competitive urge to put my sightseeing on hold and give chase.

It's a 10km climb towards Moll's Gap and eventually I manage to reel Dan in, sit on his wheel for a few moments, and then, almost to my own surprise, I attack and go past. The Ironman is good for the challenge and attacks in return, surging ahead and setting a pattern of pass





After a narrow and technical descent, the climb to the Gap of Dunloe is arduous, but the reward is spectacular



and repass that we'll repeat until the road levels out, honours even, legs burning and lungs gasping.

After a narrow and technical descent, the climb to the Gap of Dunloe is arduous, but the reward is spectacular. As we climb through the final corners, a huge plateau of rock appears before us on the left and the equally impressive Purple Mountain on the right form a V-shape ahead of us, directing our path. As we crest the summit, the road snakes like a narrow ribbon before us through a beautiful green wilderness that is both inviting and has an atmosphere of foreboding. We pause at the top, happy that our work today is almost done and revelling in the prospect of the descent through this enchanting landscape.

Mind the gap

As we begin the descent we have to concentrate to keep our fatigue at bay because these are narrow and technical roads that could punish the weary. There's hardly any traffic at all – just the odd car every 15 minutes or so, and this is no road for coaches. The only way tourists can make it up here is to drive to the base camp we will pass in a few kilometres' time and take a pony and trap ride to the top. On our way down we wave to several of these day-trippers and feel a pang of sympathy for the labouring ponies because they don't even get to enjoy the descent. We're in no hurry to get down though because the scenery is incredible.

A tight wiggle of corners at the top gives way to a more gentle fluctuation of lefts and rights. Then we cross a series of perfect arched stone bridges, the prettiest of which is known as the 'wishing bridge', with folklore saying that wishes made on this bridge will come true. My wishes right now involve food and rest, but I'm immediately distracted by the amazing scene the bridge delivers us •

Above: The pony and traps ferrying tourists up the Gap of Dunloe outnumber cars tenfold



St Mary's Cathedral rises like a huge wobbly jelly and I realise I've timed my bonk to perfection, as I can barely turn the pedals

As the light fades, Cyclist drains the last of its energy with an intermediate sprint

• into. To our right is what looks like a lush bowling lawn nestled between the mountains, with a fairytale stream meandering through it, and huge black rock boulders wedged into its surface that appear as if they've been dropped from the skies by careless or angry gods. It's magical, and lifts my spirits as the light fades in proportion to my energy.

After taking in the view, we continue the descent, past Kate Kearney's Cottage - actually a bar and restaurant where the pony and traps make their base camp. Kate was a local beauty before the potato famine, known for her hospitality and for illicitly brewing a local tipple. With our own base camp within reach, we abstain and continue our descent over sometimes rough and gravelly roads that draw out the last of my concentration, and eventually arrive at the right turn that leads us back onto the N72 to Killarney. Dan surges ahead again on the straight flat roads and I don't have the energy to give chase. Returning through Killarney, St Mary's Cathedral rises like a huge wobbly jelly in my vision and I realise I've timed my bonk to perfection, as I can barely turn the pedals back to the Killarney Court Hotel, where I vacantly devour cakes and biscuits as soon as we dismount.

This was a long, spectacular day in the saddle, but one that was peppered with delights and local colour.

There are many variations of the Ring of Kerry that we could have done, and this area of Ireland is a location that could provide a week's worth of rides. If you get the chance to visit, make sure the Gap of Dunloe is on your itinerary. Steve Westlake is production editor of Cyclist, which would be called Rothaí in Irish Gaelic

How we got there

TRAVEL

Despite being about as far away from the UK in Ireland as you can get, Kerry is very easy to reach, thanks to the Ryanair service from London Luton to Kerry Airport, which is just 17km from our starting point in Killarney. Prices start at £19.99 each way, although a bike costs £60 each way on top of that. The airport is served by the usual fleet of hire car companies, or it's a short taxi ride from the airport to Killarney.

ACCOMMODATION

Cyclist stayed at the friendly Killarney

Court Hotel (killarneycourthotel.com).

Prices start at €49 per night, and we were allowed to keep the bikes in the rooms.

THANKS

To Tadgh Moyihan from Kerry Coaches who expertly ferried our photographer, Richie, around the route and provided local knowledge and warnings about the climbs. Thanks also to Failte Ireland (Ireland's National Tourism body) and Tourism Ireland (ireland.com), who along with Ikenna Lewis-Miller, Olivia Dick and Abby Kidd, provided ample assistance with arrangements.

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FRAME WEIGHT *

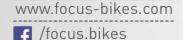
Disc: 880g

STIFFNESS

Head Tube Stiffness: 100 Nm/° Bottom Bracket Stiffness: 62 N/mm

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EXHALE

Breathing is so easy you can do it in your sleep, but could you improve your performance on the bike by retraining the way you breathe?

Words JAMES WITTS Photography DANNY BIRD

ou're doing it right now without thinking about it. Breathing is such a natural action that it would be easy to assume we're all masters at it, but it seems that, despite practising since birth, we could all do with a few lessons in how to breathe properly.

'If you can't breathe deeply enough, you might have the most powerful legs in the world but your machine won't work properly,' says Kristoffer Glavind Kjaer, body therapist for Tinkoff-Saxo. 'At recent training camps, we've focused on breathing deeply. It's far more efficient than light breathing and improves performance.' And if it's good enough for messrs Contador and Sagan...

In, out, in, out...

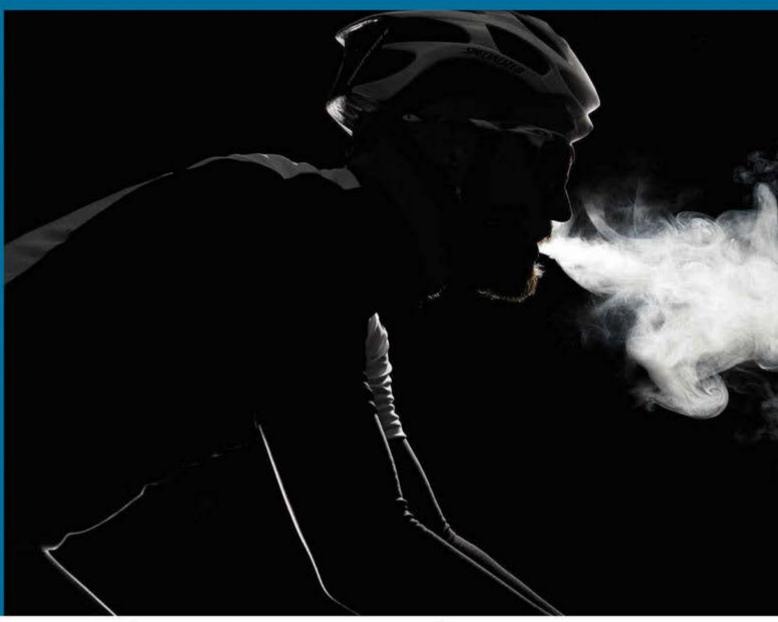
When you breathe in (inspiration), you're searching for oxygen that your bloodstream then delivers to organs, muscles and tissues. When you breathe out (expiration), you're expelling carbon dioxide, a byproduct of metabolism. As exercise intensity increases, respiration accelerates to meet the increasing demand of providing oxygen and getting rid of carbon dioxide. To achieve this, tidal volume (the depth of each breath) increases and breathing rate speeds up. During exercise, pulmonary

ventilation (volume of air inhaled and exhaled every minute) can increase by 600% compared to levels at rest.

That's just a scientific way of saying that when you exert yourself, you breathe harder and faster, but it's actually this that can cause problems. Healthy lungs provide a supply of much more oxygen than the body can absorb, so inhaling more is of no benefit. Rather, disposing of carbon dioxide becomes the key concern. What's more, during heavy exercise, the physical effort of breathing accounts for more than 15% of total oxygen consumption. So if you can reduce the oxygen cost of breathing, you save more energy for the quads, calves and glutes.

Essentially, you're looking to breathe more efficiently. So controlling breathing and strengthening the inspiratory muscles is key to breath training. Think of it this way... you train your quads and calf muscles to make them stronger, so why not train your diaphragm? It's a muscle too – a dome-shaped one that sits beneath the lungs. When you inhale, the diaphragm shortens, flattens and moves down into the abdominal compartment. When you exhale, the diaphragm and intercostal muscles relax.

'The problem is most of us breathe superficially,' says Kjaer. 'Breathing from the diaphragm increases power output by maximising your respiration system.' He •



• suggests you should inhale deeply through your nose and mouth and exhale equally as deeply through your mouth (see box, right, for his diaphragm training techniques).

Kjaer isn't alone in mooting the benefits of diaphragm breathing on cycling performance. Alison McConnell is professor of exercise physiology at Brunel University. More than 15 years ago, she researched why older people got out of breath quicker than people in their twenties. She concluded that, like skeletal muscles, breathing muscles grow weaker with age. It led her to develop an inspiratory tool called the Powerbreathe.

'There's evidence that strengthening your inspiratory muscles, like the diaphragm, makes breathing easier,' she says. 'It's a neuromuscular influence, like if you lift 10kg. It'll be easier on your bicep after a month than on day one.'

McConnell has conducted numerous studies into the subject, including one that showed cyclists' time-trial performance improved by 3.8% over $20\,km$ and 4.6% over $40\,km$ after six weeks of inspiratory training. Their perception of fatigue also came in lower.

'As well as strengthening the diaphragm, it could have been because of what's called the cardiovascular reflex,' she adds. The reflex originates from the breathing muscles. When you work hard, the reflex is activated and restricts bloodflow to the limbs. 'It's counterproductive, really,

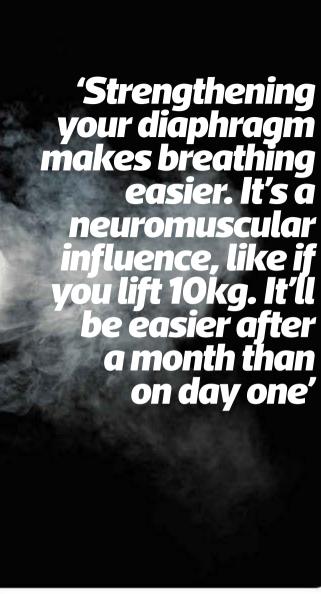
because your working muscles need more blood, not less, but it's down to the body maintaining blood pressure so you don't faint. But if you train the diaphragm, this reflex can be delayed so your muscles can work harder for longer.'

McConnell clearly has a vested interest in promoting the Powerbreathe, but says you can also strengthen the diaphragm by pursing your lips while exercising. It creates a small resistance and potentially has a training effect on inspiratory muscles. However, if you do try Powerbreathe, 'two minutes a day is all that's required to improve performance'. There's also evidence that it improves a rider's ability to train and race at altitude because of improved breathing efficiency.

Deep-breathing is all well and good when cruising along at 50% of your max. But what about when the terrain heads upwards, and takes your heart rate with it?

'Elite cyclists show close entrainment between cadence and breathing frequency [they synchronise], so they might have a ratio of one, two or three pedal strokes per breath, depending on intensity,' says McConnell. 'It's hard to measure the effect of breathing patterns on oxygen cost and mechanical efficiency, but the fact elites subconsciously maintain this synergy shows there's an advantage.'

McConnell states that, as intensity rises, recreational riders either breathe erratically and shallower – sometimes



to hyperventilating proportions – or sync their breathing with a pedal rate that's too high. Practising deepbreathing can help with this, but we all reach a point where things can unravel.

'Breathing suffers around the lactate threshold,' says McConnell. 'Acid has a potent effect on breathing. It's because breathing above the lactic threshold isn't about breathing oxygen – it's about the elimination of carbon dioxide and the metabolism of lactic acid.'

It's a notion supported by Kjaer. 'The deep-breathing pattern is hard to maintain at high intensities even for the Tinkoff riders,' he says, 'but it's something we're working on.' That's why he stresses you should work on the exhalation part of breathing over inhalation. 'When you ride, breathe out well – it clears the carbon dioxide.'

If time-trial is your race genre of choice, McConnell suggests you make training specific by Powerbreathing in the aero position. We suspect crouching on all fours with a plastic vessel clamped between your teeth is something you should practise in the privacy of your own home, but it does highlight how the more extreme nature of the TT position impacts upon breathing.

'The aero position compresses the diaphragm, which exacerbates the perception of fatigue when breathing,' says McConnell. 'We've studied novices and experienced

cyclists. With novices, oxygen cost goes up, tidal volume goes down and breathing frequency goes up, and it's all a manifestation of this restriction.'

The diaphragm and other trunk muscles adapt over time, but even the best time-triallists see an average power drop of around 30 watts, compensated for by reduced drag from the streamlined aero position.

'All of the muscles of the trunk are in some way involved with breathing and also stabilising the trunk in the aero position,' says McConnell. 'That's why exercises such as the plank, ideally with a bit of inspiratory training, will improve your TT.'

The Obree method

One man who knows more about time-trials than most is Graeme Obree. One of the finest and most enigmatic cyclists the UK has ever produced, he became renowned in the 1990s for his battles against Chris Boardman over the Hour record. It was pure Hollywood. Boardman became known as The Professor for his appliance of science. Obree built his own bicycle from parts that included bearings borrowed from a washing machine.

His exploits were dramatised in the film *The Flying Scotsman*, where Jonny Lee Millar plays Obree, depicting his bipolar disorder, fight with the UCI and innovative – and outlawed – bike positions. But one area Millar didn't focus on was Obree's three-phase breathing pattern.

'For the first breath of the three-breath pattern you start from reasonably full lungs, then exhale strongly and much further than you would normally, then inhale to a slightly greater depth than normal,' Obree writes in his book *The Obree Way*. 'At this point you have as much oxygenated air as possible in as inflated as possible lungs. The second breath is half a breath in and out, while the third breath should be an even smaller breath.'

The reason for this incremental breathing pattern, Obree tells us, is that constant deep breaths or rapid smaller breaths, like panting at high intensity, either leave too long a period between gas exchange or not enough time to exhale carbon dioxide. 'The three-breath plan is the perfect compromise,' he says.

Further pointers to master Obree's method include flaring your nostrils during intake to aid airflow – 'it's •

Take a deep breath

Tinkoff-Saxo body therapist Kristoffer Glavind Kjaer prescribes two breathing techniques to help improve performance

Meel down and sit back with a pillow between your backside and legs for comfort. If that's uncomfortable you can do this exercise sitting on a chair. With a straight back simply put your chin down and then lift it back, so you're opening the whole respiration system. Then breathe in deeply through your nose and mouth before exhaling heavily through your mouth. Repeat for a few minutes.

2 To force yourself to fully engage your diaphragm, close your mouth and breathe through your nose. Shallow breathing simply won't work in this case, and so at some point your body will respond by using the diaphragm. You can do this on and off the bike, but on the bike it's really tough. It demands a lot of self-awareness and self-discipline but the benefits are significant because you are also working your core.

At last year's Vuelta, Chris Froome tweeted that he'd used the Turbine breathing aid, a stent that claims to improve airflow by 38%

• something I've done since I was 18' – and placing the tip of your tongue on the roof of your mouth so the air passes over the underside of your tongue. 'This heats the air up, which means there's quicker gaseous exchange between the lungs and bloodstream. This is particularly useful on cold days as the lungs really don't appreciate cold air.'

Obree says the three-breath method has become natural during any activity, even climbing stairs. 'It took me two weeks before it became second nature. The secret at the start is not to ride with other people and their distractions. If you want to check its effectiveness, try a long climb at full tilt and alternate between both techniques.'



Would you breathe it?

Respiration facts to surprise and entertain

- Breathing is the only autonomic system of the body that we can also control.
- If your lungs' alveoli (the membrane that absorbs oxygen) were unraveled to lay flat they would cover an area the size of a tennis court. Don't try this at home.
- Miguel Indurain's lung capacity measured nearly eight litres. The average is six litres. However, lung capacity has been shown to have little effect on aerobic performance. Red blood cell density is the most dominant factor.
- A blue whale's lung capacity is 5,000 litres.
- A study out of Kent University showed that about a third of Team Sky riders are prone to either asthma or exercise-induced asthma. Extended periods of deep breathing are a known cause...
- At rest we inhale as little as 8-12 litres of air per minute. During exercise this
 can rise to as much as 150 litres per minute.
- Only one quarter of oxygen inhaled by the lungs is used.

The incremental nature comes into its own at high intensity, Obree says, and should make riding easier. Then again, here's a man whose body is so tuned to cycling that he adopts a TT position on his commuting bike.

Nasal credibility

Football fans of a certain age will remember Robbie Fowler scoring the winning goal for Liverpool against Everton in 1999 and subsequently pretending to snort cocaine on the pitch markings. It wasn't the first time his nose had hit the headlines as Fowler was one of many sportsmen to adopt the late-90s fashion for Breathe Right nasal strips. These were designed to increase the size of the nasal airway and subsequently, it was claimed, improve airflow by 31%.

A Swiss specialist, Dr Beat Villiger, tested the viability of nasal strips and concluded that they made breathing slightly easier during low or moderate activity, but not at intense levels because of a phenomenon known as the 'switch point' where breathing changes from the nose to the mouth. Breathe Right adopted Villiger's advice and now markets its strips to 'help you sleep better by breathing better', but the world of cycling hasn't abandoned the concept yet. After Stage 1 of last year's Vuelta, Chris Froome tweeted that he'd used the Turbine breathing aid, a soft, pliable polymer stent that dilates your nasal passage and purports to improve airflow by 38%.

Dr Mitch Anderson, sports medical advisor for Rhinomed, the company behind the Turbine, says, 'Air wants to move from high [atmospheric] pressure to low pressure [inside the windpipe],' he says. 'By stenting the nose with the Turbine, more air will be passively entrained, which is an efficiency gain.'

It's a claim that has yet to be substantiated, but Anderson is hoping to do just that with a trial at Murdoch University, Australia. In a previous trial on nine cyclists, a reported 3.7% increase in power was recorded using the Turbine, although other users have seen no positive influence on average heart rate or perceived exertion. Like many marginal gain tools, it could simply be a matter of belief. Believe it works and it will; don't and it won't.

What's more proven to improve breathing, according to Kjaer, is yoga. He's also a fan of pilates, citing that they both improve your awareness and aptitude for deep breathing, as well as posture.

Working on deep breathing can be done anywhere and consumes little of your daily routine. It's easy to be cynical about a concept that's hard to quantify, but the science adds up: the diaphragm is a muscle and all muscles adapt to overload. And for just two minutes' practice a day, surely a spot of deep-breathing (legal, not the phone kind) is worth the investment.

James Witts is a freelance journalist who takes a very deep breath before writing his articles



Patron

Known for crushing opponents, bossing the peloton and solving disputes with his fists, Bernard Hinault cuts an intimidating figure even on a good day. When *Cyclist* meets him, 'The Badger' is nursing a hangover... Words MARK BAILEY Photography LISA STONEHOUSE Translation AMÉLIE GUILLO

rench cycling legend Bernard Hinault once told *Cyclist* that his nickname 'Le Blaireau' (The Badger) came about simply because it was a common term of greeting in his youth – *How*'s it going, badger? However, it's certain the name stuck thanks to his ferocious tenacity and savage fighting spirit. With his incisors bared, the gritty Breton battled his way to a huge collection of trophies, including five Tours de France – the last of which he won in 1985, even though a crash and infection meant he finished with two black eyes, a broken nose and bronchitis.

Hinault was never afraid of a scrap – literally or metaphorically. He threw a flurry of right hooks at striking dockyard workers who blocked the road during the 1984 edition of Paris-Nice, and his vitriolic battle with his teammate Greg LeMond at the 1986 Tour still sends tremors through cycling history. Brutally honest, Hinault once said he would like to put tacks in his jersey to stop people patting his back after races, and declared that if he had been born in the Middle Ages he would have been a 'warlord' battling for castles and land.

So when I am due to meet Hinault for a rare exclusive interview at The Grand Hotel in York,

I can't help but shift uncomfortably in my seat at the whispered news that The Badger has what the French call 'une gueule de bois' – a hangover.

Gary Verity, a garrulous sheep farmer and the chief executive of Welcome to Yorkshire, is apparently the man to blame. Hinault worked as a dairy farmer on his retirement in 1986 but now serves as an ambassador for Amaury Sport Organisation (ASO), which runs the Tour de France, and he has come to York to do promotional work for the inaugural Tour de Yorkshire. The two men, it seems, share a mutual passion for farming and vin rouge.

Yet Hinault, now 60, has overcome worse things than hangovers in his career and there is no sign of a fuzzy head when he arrives in the hotel lounge. Wearing tinted glasses and smart trousers, he could be mistaken for any other mature businessman at the hotel, but his body language is different: the unmistakable upward jut of his chin and proud posture are reminders that we are in the presence of sporting royalty – a king whose talent and raw determination enabled him to dominate the world of cycling.

Hinault is curt but polite, direct yet strangely inscrutable. His biggest smile comes when he hears that our translator, Amélie, comes •

In the UK to promote the Tour de Yorkshire, Hinault has become an Anglophile. 'The Tour de France in Yorkshire was superb, just wonderful'





'Maybe some of us have physical skills, but it is only by working hard that we become better than everyone'

• from Brittany in northern France. Bretons are renowned as proud, tough, insular, hard-working people and Hinault clearly feels at home in gritty Yorkshire. 'The Tour de France in Yorkshire was superb, just wonderful,' he says. 'I have been involved in cycling for about 40 years and that was the first time I'd seen that many people at a race – and it was all in just three days.'

When I ask whether he enjoys the style of British cyclists, my question gets charmingly lost in translation, but his answer is revealing. 'Cyclists like Bradley Wiggins, Chris Froome and Mark Cavendish each have their own style. But I think above all they are competitors. They are there to win. That is the most important thing in cycling. Then I don't mind at all if they have a beard or not.'

Hinault was a ruthless assassin on the bike. He was perhaps the last rider capable of succeeding in the full spectrum of cycling events and disciplines. 'I expressed myself in every field,' he says. 'I won Classics, I won Tours, I won in the sprint, I won in the mountains, and I won in time-trials. I had the possibility to compete and win in every field. Even when I was second, the one in front knew I was more dangerous.'

The fighter

Bernard Hinault was born in Saint-Brieuc in Brittany on 14th November 1954. He grew up in the small town of Yffiniac with his father Joseph, who laid plates for the SNCF train company, his mother Lucie, two brothers and a sister. The hardworking culture of Brittany has forged many top cyclists. Tour winners Lucien Petit-Breton, Jean Robic and Louison Bobet all emerged from the region, where harsh winds, rain and a ferocious working class spirit sculpted inner steel.

As a boy, Hinault harvested vegetables on the family farm, but he admits in his autobiography that he was 'the most terrible scoundrel'. He earned the nickname 'Cerdan', after the French boxer Marcel Cerdan, because he loved fighting boys in the village.

Cycling seemed to provide an outlet for this fighting spirit. 'The first bike I got I shared with my brother, in around 1962,' he recalls. 'I didn't watch races or have much interest in the famous athletes. I enjoyed watching my cousin [Renee] who was a local racer. From watching him race, the door was opened.'

A strong runner who finished 10th in the French Junior Cross Country Championships,



Hinault was also a natural on the bike, winning his first five amateur races. 'In the beginning I came from a running background but I was more attracted by cycling,' he says. 'Maybe some of us have physical skills that make us better than others, but it is only by working hard that we become better than everyone – otherwise we all stay at the same level.'

In 1973 Hinault completed his military service, training with the tank artillery. On his return to civilian life he showed his cycling potential by coming second in the prestigious Route de France in 1974, the same year he married his wife, Martine. He started racing professionally for the Gitane team in 1975. In 1977 he became the first Frenchman to win Ghent Wevelgem since Jacques Anquetil in 1964, and on the penultimate stage of the Critérium du Dauphiné he fell into a ravine, scrambled out, and went on to win both the stage and the race.

'When we crash, we just set off again – this is racing,' he shrugs, nonchalantly. 'Others didn't catch me. At the moment of the crash I had no real doubt. It is only the day after, when you are injured and the others attack, that you are in difficulty and you think it might be a hard day.'

Hinault went on to win a stunning range of trophies with Gitane, Renault-Elf and La Vie Claire. He enjoyed epic battles with Joop Zoetemelk, Lucien Van Impe and Greg LeMond to win five Tours de France in 1978, 1979, 1981, 1982 and 1985 – a historic record he shares with Eddy Merckx, Jacques Anquetil and Miguel Indurain. He also won the Giro d'Italia in 1980 and 1982 and 1985, and the Vuelta a Espana in 1978 and 1983. He is the only rider in history •

Hinault's toughness was legendary, but to him it was just part of who he was as a cyclist: 'When we crash, we just set off again – this is racing'

BERNARD'S BEST BITS

Three highlights from an eventful career

1980 WORLD ROAD RACE CHAMPIONSHIPS

Hinault's victory at the Worlds in Sallanches, France, in August 1980 was all the more special given that he'd had to abandon the 1980 Tour de France with knee problems just weeks earlier. It was a definitive statement that confirmed his guts and determination as well as his unique talent.

1981 PARIS-ROUBAIX

Hinault hated cobbles, blaming them for his knee problems, and once called Paris-Roubaix 'a stupid race'. But he won a sprint finish in the velodrome to prove the extraordinary range of his cycling abilities – as well as his insatiable desire to win races that didn't even suit his style.

1985 TOUR DE FRANCE

Hinault defied a bout of bronchitis, plus a crash on Stage 14 of the 1985 Tour that left him with a broken nose and two black eyes, to claim his historic fifth Tour win – a record he shares with Jacques Anquetil, Eddy Merckx and Miquel Indurain.



to have won each Grand Tour more than once. He also claimed the World Road Race Championships in 1980, Paris-Roubaix in 1981 and Liège-Bastogne-Liège in 1977 and 1980.

The way modern riders now specialise in disciplines and cherry pick races frustrates him. 'It's a pity,' he says. 'Everybody can't win the Tour but riders can win beautiful Classics like Liège-Bastogne-Liège, La Fleche Wallonne and the Amstel Gold Race. You can't say, "I will just do the Tour de France." You have to try to win most of them. Currently we have a system with a WorldTour involving 17 teams. I would like us to have a system like in football, with three divisions, so the last three are relegated and the top three move up. That would force riders to do more races. I don't want cycling to be based on money. I want to see it based on competition – on the need to win.'

Bite of the Badger

The Frenchman's riding style involved a pugnacious mix of punishing breaks, blistering attacks and domineering psychological tactics. In his new book *Bernard Hinault And The Fall And Rise Of French Cycling*, journalist William Fotheringham reveals some remarkable first-person accounts of Hinault's fearsome reputation. Lucien Van Impe recalls, 'I've never seen inner anger like his.' Robert Millar

'You have to think that the others are suffering even more than you. So when you suffer, you push them even harder'

HINAULT ON...

... DOPING

'It was a bad period that we need to get past. Cycling is maybe the cleanest sport of all right now. I don't know how it is in England but I know that in France people understand today that drugs have affected all sports – not just cycling.'

... HIS BIGGEST REGRET

'When you win, you forget everything. When you don't win – like in 1980 when I had to abandon the Tour because of my knee – it is much more painful. I knew I could win because in five days I won three stages. I was well set to make a good collection of victories. But that is life.'

... MODERN RACING

'I still have the same passion for cycling and I love watching good riders who make great efforts. But unfortunately I get disappointed because the race is often decided only on the final climb. If riders raced over several cols it would be better.' remembers Hinault's terrifying death stares during the 1980 World Championships: 'He looked like he wanted to murder us.' Paul Kimmage admits that 'he frightened me', recalling how Hinault would race away from the rest of the riders then laugh, as if 'mocking us'.

'I think people like me were born competitors,' says Hinault. Ruthlessness was simply part of the game. 'At some point, if you want to win, you have to suffer, so there is only one thing to do,' he says. 'You always have to think that the others are suffering even more than you are. So when you start to suffer, you push them even harder.'

Hinault was the last of the great 'patrons', the alpha males of the peloton whose reputation •



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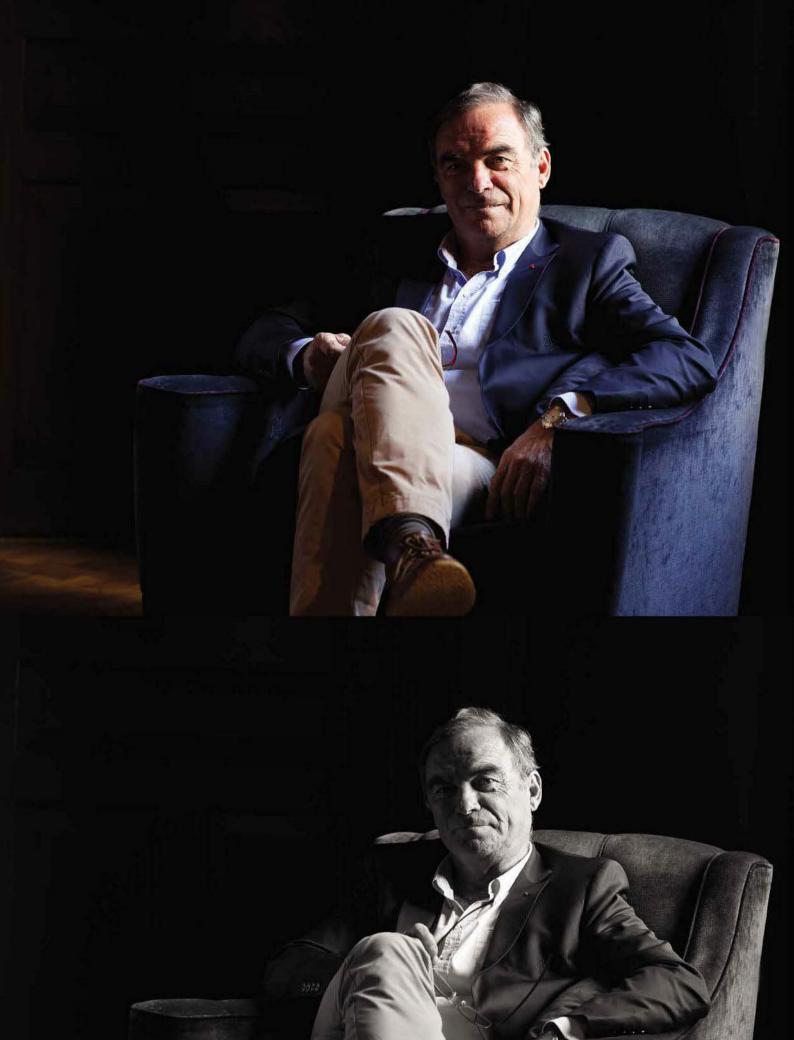
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Hinault still has frostbite from the 1980 Liège-Bastogne-Liège. I had to race to warm myself up and I found myself alone in front. I didn't even think about the cold' • and success enabled them to dictate when riders would race, who would be allowed to win stages, and how riders would protest against bad decisions by race organisers.

'The patron is the one who stood at the front when we went on strike; the one who defends the riders; the one who imposes his rules on the other riders by saying, "Today we race and we are really going to do it," or, "Today nobody moves." If anybody moved, you attacked and then you put everybody far away. The next day they understood the lesson.'

His personal feats of bravery are legendary. At the 1980 edition of Liège-Bastogne-Liège he overcame Antarctic conditions, battling through blizzards, frozen puddles and raking winds, to win by nine minutes and 27 seconds. Only 21 of the 174 competitors finished. During the race he suffered frostbite in two fingers, which still blights him today.

'I was aware it was dangerous because it was snowing and things weren't going well,' he recalls. 'But when we were at the refreshment point the weather got better and [Renault team boss] Cyrille Guimard said to me: "Take off your rain jacket." When I did this it meant I had to race to warm myself up and I found myself alone in front. I didn't even think about the cold.'

Hinault is adamant that he doesn't have a favourite Tour memory: 'I put them all on an equal footing. With the five Tours it was always a joy to finish in Paris and to be on the Champs-Élysées with the yellow jersey. They all have different routes and they all mean something.'

Yet it is the 1986 Tour that will forever be remembered by cycling fans. The controversial saga has filled books, been adapted into documentaries and continues to baffle and bewilder today. The narrative is simple enough: Hinault was helped to victory during the 1985

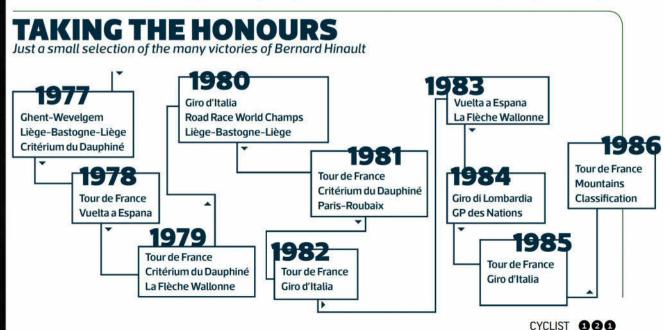
Tour by his young American teammate Greg LeMond and in return promised to help LeMond win the following year. During the 1986 race, however, Hinault repeatedly attacked, at one point taking a lead of over five minutes, before LeMond fought back to win. LeMond remains furious, claiming he was betrayed, but Hinault

'Me and LeMond were friends before the 1986 Tour and still are. The rivalry that the press wrote about is not true'

disagrees, insisting that his attacks were designed to wear down LeMond's opponents.

Accusations and denials have been hurled around for 30 years, so it's impossible to interview Bernard Hinault without asking the questions everybody wants to know the answers to. Firstly, did you have an agreement with LeMond? 'For 1986? Yes, I gave him my word that he would win,' says Hinault. And did you attack LeMond? 'I don't see it like that,' he says. 'On the stage to Pau I attacked but with the aim to make Phil Anderson, Stephen Roche and Pedro Delgado work, but unfortunately they came with me. But we had to make our adversaries work.'

Hinault insists they remain good friends:
'Of course, me and LeMond were friends
before and still are. The rivalry that the press
wrote about is not true. I kept in touch with
almost all the riders I raced with, like Merckx, •



'I still ride if it doesn't rain too much. In a year I ride between 6,000 and 8,000km, but just for fun'

Hinault predicts an epic battle for the 2015 Tour de France: 'Froome, Nibali, Contador, Quintana and maybe the young Italian Fabio Aru. They can all win'

To Zoetemelk and Roche. I have always said that during the competition we fight against each other but during the evening we should be able to eat together. That is the real spirit of the sport.

Softening with age

Today Hinault is more mellow than during his explosive days as a rider. After refusing to ride a bike for 20 years following his retirement in 1986, while he focused on farming and business, he's back on his bike and looking forward to September's L'Etape London, a new event for amateurs established by the Tour de France and race organisers Human Race, which mirrors much of the route of Stage 3 of the 2014 Tour.

'I still ride if it doesn't rain too much,' he says, smiling. 'In a year I ride between 6,000 and 8,000km, but just for fun.'

He admits to feeling sad that there hasn't been a French winner of the Tour since his last win in 1985. 'It's been 30 years and I think that it is a pity. The answer is simple: we need an athlete with exceptional physical skills who is better than the others.'

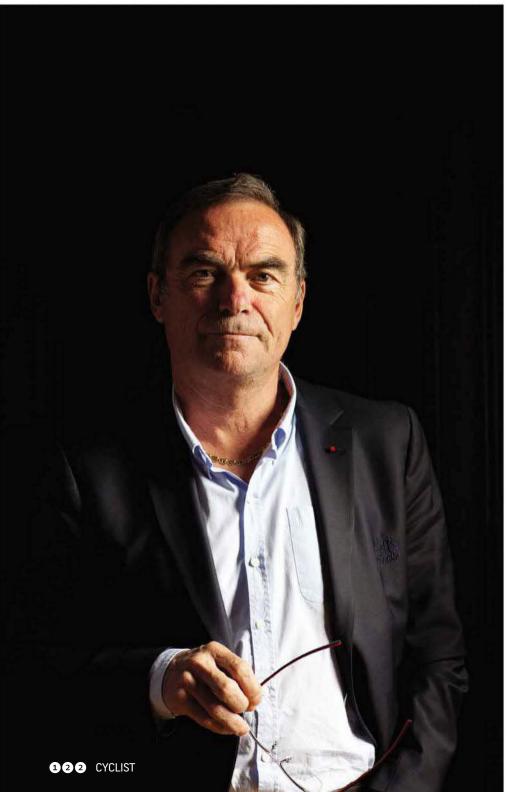
Who does he think will win this year's Tour? 'Hard question,' he says. 'Today there are five riders who are more or less level: Chris Froome, Vincenzo Nibali, Alberto Contador, Nairo Quintana and maybe the young Italian Fabio Aru. They can all win the Tour. But this year there are cobbles and stages by the ocean where we can expect crosswinds so anything can happen.'

We finish the interview with a stroll around the historic centre of York. The Badger seems relaxed. When he stands alone for a photograph on Lendal Bridge above the River Ouse, zipping up his coat against the cold, it is hard to imagine the 60-year-old as the ferocious young warrior who hauled his battered body out of a ravine to win the Dauphiné, endured frostbite to claim Liège-Bastogne-Liège and engaged in a blisteringly personal duel with Greg LeMond. Over time the man has become a myth.

But there's something about the thin, knowing smile that accompanies many of his explanations about his crushing victories and ruthless behaviour that suggests The Badger knows he has simply played the game he was born to play – and ended up winning everything. Cycling is, above all, a human story, and Hinault embodies all the strengths and flaws that make great athletes so compelling.

'I am a human being like everybody else,'
he says. 'I had this chance to practise this sport
and to win, but that did not change my way
of looking at things or my way of living –
and it never will.'

L'Etape London takes place on 27th September 2015. Visit humanrace.co.uk/cycling





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Caus stomping ground

From Chester through the hills of north-east Wales, this route follows in the wheel tracks of Mark Cavendish's old training rides Words MARK BAILEY Photography JAMES OATEN









o battle up the 'Leg Stinger' – a punchy climb on a rural farm track in northeast Wales that kicks up to a venomous gradient of 27% – I am forced to adopt the zigzagging path of a Saturday night drunk, slaloming from one side of the path to the other in a futile bid to neutralise the sharp ascent. The road is so steep in places that my front wheel leaps off the serpentine slither of tarmac like an agitated horse rearing up at the hiss of a rattlesnake.

I know I'm riding slowly. My Garmin keeps shaming me with flashes of 5, 6 and 7kmh, but the tragic reality of my climbing speed finally hits home when the car behind me – which until now has been patiently trailing me up the single-lane track – starts to choke and stutter, then promptly stalls. I realise, through the fog of pain and panting, that I have reached a speed that a car engine no longer equates to forward locomotion.

The ascent perfectly epitomises the character of this gritty but glorious part of Wales. The alluring landscape may appear soft and fluffy, with its undulating hills, forested valleys and heather-clad meadows, but the

region hides some ramps that will give unsuspecting visitors a kick in the backside.

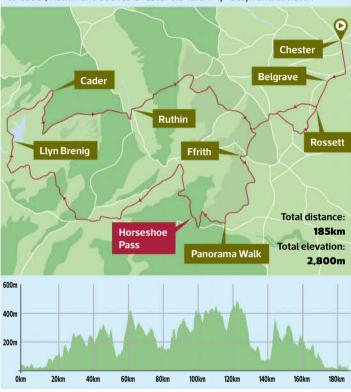
In this atmospheric Anglo-Welsh border realm, history has piled up over the centuries like layers of sedimentary rock. As I journey through the rural landscape I pass the sites of Iron Age hill forts, Roman towns, Norman castles and modern country houses. The dark hills are alive with Arthurian legends and the tales of ancient Welsh heroes, such as Owain Glyndwr, a rebel prince who instigated an uprising against the English in 1400 (think Braveheart with leeks and daffodils). He would no doubt be delighted to know that the local geography is still capable of repelling invading Englishmen many centuries later – even if they now arrive armed with Lycra and carbon fibre, instead of chainmail and horses. The enchanting valleys are also dotted with the visible remains of old industries, from quarries and mines to tramways, canals and water mills.

Amidst the bucolic Welsh beauty, however, there lurk some beasts. The Leg Stinger, as it has been dubbed by local riders on Strava, twists and turns through 124m of vertical ascent in just over a kilometre, averaging around 10%. But its lower reaches feel as steep as the walls of the limestone





To download the route go to tinyurl.com/ofvx4h3, or for full directions download the *Cyclist* app from the Newsstand. In short, head south out of Chester to Eccleston and west to Belgrave. The B544 takes you to Pulford and into Wales to Rossett. Follow the River Alyn to Rhyddyn Hill, and from Bridge End go to Ffrith, then go southwest. Head for the Ty Mawr Reservoir to Tref-y-nant brook, and on to Panorama Walk and Llangollen. From here it's north to Horseshoe Pass, and on to the Llyn Brenig reservoir. Then head to Cader, Ruthin and back to Chester via Tafarn-y-Gelyn and Lavister.





Tused to ride in

this area a lot so

it has some special

quarries that erupt out of the surrounding landscape. It's one of those harmless-looking climbs that barely raises an eyebrow when you scout the course profile but which leaves your eyeballs bulging when you find yourself huffing and puffing to the top.

Cavendish territory

Such challenges seemed unlikely a few hours earlier when I was scoffing pastries in Chez Jules cafe in Chester, just east of the border with Wales, and plotting the day's route with my ride companions, Luke, Kayleigh and Danny. The 110km loop will take us through the hills and valleys of Flintshire, Denbighshire and Conwy, and showcase the iconic climb of Horseshoe Pass – a previous location for the British National Hill Climb Championships.

Our route is largely based on the course of the new Rise Above sportive – the official sportive of Mark Cavendish – which takes place on Sunday 9th August. The Manx Missile has been heavily involved in the planning. 'Mark is keen to ensure this will be a tough and challenging ride that people will enjoy and remember,' says Luke, who works for SweetSpot, organisers of the sportive. 'He wants it to be •



Below: The rocks and earth of North Wales hide some very challenging tarmac • a premium and well-organised event but he definitely wants people to know they've had a proper ride.'

Cav himself seems excited about the prospect, as he told me during an interview on a different day: 'Seeing all these people ride their bikes around beautiful places like north Wales and Chester is going to be amazing for me,' he said. 'I used to ride in this area a lot when I was a teenager so it has some special memories. I would stay in Liverpool and train in Wales and Chester so I know the roads really well. To see people testing themselves and enjoying a big challenge on the same roads that I used to train on is something I can really relate to and there will be an amazing sense of reward for me as well as for them.'

Panorama walks

On the day we ride, the weather forecast predicts heavy downpours, but there are no rain clouds looming overhead when we clip in and slowly weave our way





While the weather stays dry we enjoy an electrifying 175m descent, slowed only by the occasional rattle of cattle grids

out of Chester. The historic town, which can be dated back to a Roman fort called Deva Victrix in AD79, provides a scenic start to the day's activities, with its bone-shuddering cobbled roads, ancient town walls and striking cathedral. We dive beneath the Eastgate Clock (claimed to be the second-most-photographed clock in Britain, behind Big Ben) and over the sandstone arches of the 14th century Old Dee Bridge before venturing out onto quieter country roads.

Within a few minutes we're whizzing past the quaint red-brick houses of Eccleston and the black and white Gothic revival cottages of Marford. Best not hang around here, mind – many of the houses are decorated with crosses that are said to protect inhabitants from the ghost of 'Lady Blackbird', a murdered local woman who taps on the windows of homes late at night.

We pick up the pace as we blast past Pulford, with Kayleigh, a natural time-trialist, leading the way. We pass a mound of earth that marks the site of an old Norman motte-and-bailey castle that used to guard the border between England and Wales.

Crossing the bridge over the Pulford Brook signifies our arrival in Wales, which welcomes us with a few short climbs, including Rhyddyn Hill, Cymau Lane (82m with an of average 6% but with jolts of 17%) and Mount Zion (at 101m, much smaller than its more famous 765m-tall cousin in Jerusalem). Settling into a comfortable pace, we plunge under the canopy of the surrounding woodland lacksquare



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and skirt the Ty Mawr reservoir before a climb up Bronwylfa Hill and another ascent through Black Wood.

As we head deeper into the rural landscape I feel my muscles relax. Around us are wooden stiles, stone walls and fields dotted with sheep. There are pretty villages with thatched roofs and red phone boxes, and narrow country lanes tattooed with the muddy tyre marks of farm vehicles.

After a short climb we arrive at the scenic lookout of Panorama Walk, where we enjoy a sweeping view of stark hills, rocky crags and dense forests. The descent back into the soft blanket of the valley leaves my eyes streaming with wind-lashed tears behind my sunglasses. After a blast through the valley we arrive just north of Llangollen, on the edge of the churning waters of the River Dee, where we pass a 600-year-old water mill. We then head north, riding parallel to the boulder-strewn river, and arrow towards the most famous climb of the day - the Horseshoe Pass.

The climb curls around a valley (yes, the shape of a horseshoe) for 6.1km, rising 317m in altitude. Although it's the sort of climb on which a rider can get into a steady rhythm, there are stabbing sections at 20% that cause lactic acid to rush into my legs.

The route here dates back to an old turnpike road from 1811. Open and exposed, it suffers severe weather in winter. The website for the Ponderosa Cafe, which sits at the top of the pass, carries a 'road open/closed' status similar to those seen on Alpine cols. Today there is no danger of weather problems, but as we begin to ascend it's easy to imagine the wintry chaos that comes with icy roads and raking winds blasting across the valley.

The climb starts with a gentle rise, but when we edge around a bend the gradient starts to increase. I can see the whir of Luke's bright yellow shoes start to slow as the cumulative effect of the climbing so far begins to take its toll on all of us. Except for Danny, the quickest of our



The rider's ride

Specialized Venge Expert, £2,800, specialized.com

For a ride with connections to Mark Cavendish, it seemed only fair to ride the bike he is most associated with: the Venge. Being stiff and aero, it was always going to be fast, but the guestion was how it would feel on a long hilly ride. Sure enough, on the flats everything felt crisp and the handling was pin-sharp (Specialized claims this bike will save you 22 watts at 40kmh compared to the Tarmac). But even when the climbs came thick and fast, the bike excelled. Despite being a sprinter's bike, the Venge can climb like a goat, and I often stayed in the saddle to drive up and over the climbs. This bike is about all-out performance but I'd be happy to use it for a hilly century ride too.





Today the cloud is denying us a view of Mount Snowdon so we construct our own mountain of food instead, which slowly disintegrates as we hungrily refuel for the afternoon ahead

group, who catapulted himself skywards some time ago and we conclude that he is probably downing a slice of carrot cake in the cafe right now.

The views are worth the sweat, though, as we climb past fields covered in red, brown and purple heather and glance down at thick forests of fir. It's no surprise this spot falls within a protected Area of Outstanding Natural Beauty.

A stark ridge of grey slate rises up to the left of the road, a reminder of the abundance of slate in the region that is still quarried today. After cursing and swearing, we finally reach the cafe, which to our delight is stocked with chunky tuna sandwiches, sausage butties, steak pies and – gloriously – chip baps. Today the cloud is denying us a view of Mount Snowdon so we construct our own mountain of food instead, which slowly disintegrates as we hungrily refuel for the afternoon ahead.

A sting in the tail

One look at the metallic sky above suggests we'll be getting soaked at some point today, but while the weather stays dry we enjoy an electrifying descent along the A542, slowed only by the occasional rattle of cattle grids.

A rare flat section follows as we glide past the villages and towns of Carrog, Corwen and Tyn-y-Cefn and zip below the stone rampart of the Caer Drewyn hill fort, which dates back to the Iron Age. When we pause for a drink in the town of Corwen, Owain Glyndwr himself appears behind us, brandishing his sword. This imposing statue has been constructed to commemorate the rebel hero but it proves to be a fitting warning for what's ahead.

When we reach a sawtooth ridge of sharp climbs and tight, swirling descents I realise that I had made a big mistake in assuming that Horseshoe Pass – the most •



Don't be fooled by this seemingly innocent photo – Horseshoe

Pass spikes up to 20% in places

• well-known climb on the route – would be the biggest challenge of the day. There are tougher obstacles to come.

For the next hour we battle through a series of short but explosive climbs that rise slyly out of the tranquil farming landscape and heathland. There is the Treddol climb, which has jolts at 16%, and the Betwys climb, which rises 101m at an average of 9%. Then comes the Leg Stinger.

At the bottom of this one, long tree branches dangle over the road as if trying to tickle us. By the time we reach the top it feels as though they are trying to throttle us.

The hills in this area are all similar in character: single-lane farm tracks surrounded by trees and hedges that block any view of the top, ensuring you're lost in a bewildering battle for an unknown summit. Our mood continually oscillates from one of hope to horror as we think we spy the top of the climb only to face another stretch of tight bends curling upwards.

Surfing an endorphin high after the streak of short climbs, we push on through flower-strewn grasslands and past limestone crags and damp riverside woodlands. We hurtle over stone arched bridges and pass striking white

Do it yourself

Travel

The town of Chester is the best base for the loop and is easily accessible via Chester train station or a short drive from the M6. M62 or M1.

Accommodation

Cyclist stayed at the Best Western Westminster Hotel in Chester, which cost £59 per night plus £10 parking. There was a solid breakfast buffet to kick-start the day, nobody seemed to have a problem with keeping the bike in the room, and there is free wi-fi for double-checking Google Maps before you ride.

Sportive

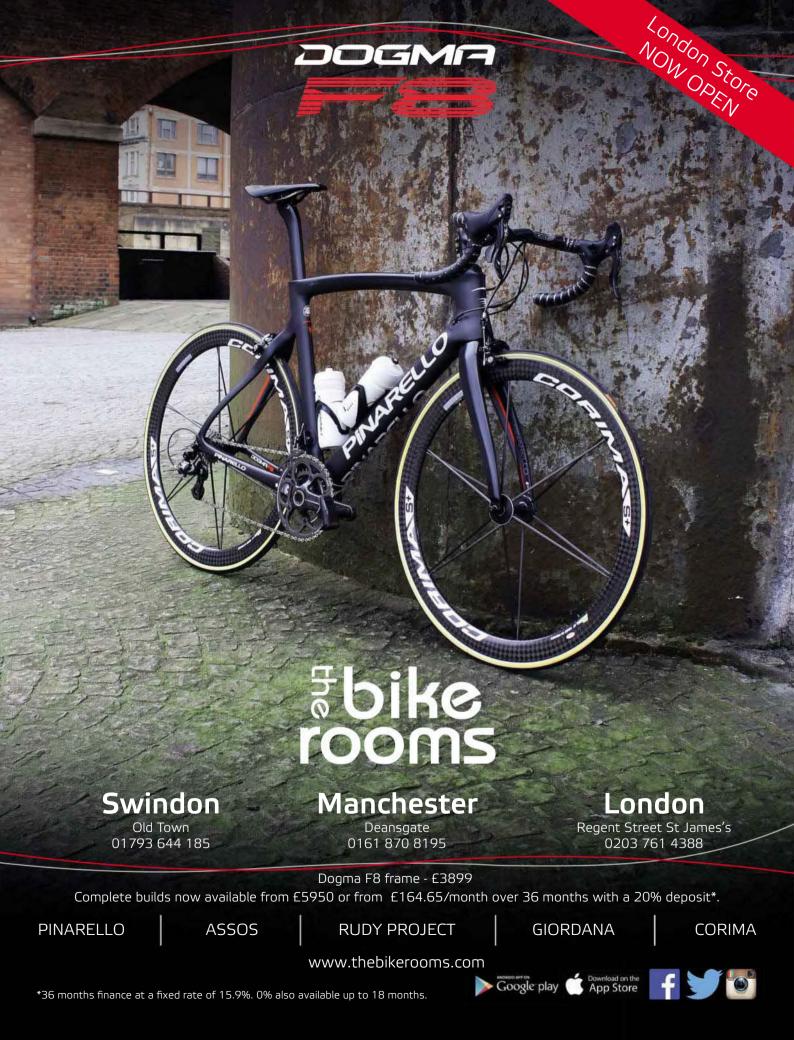
You can tackle much of the same route at Mark Cavendish's official Rise Above sportive on Sunday August 9, which offers distances of 80, 120 and 185km. The event includes a closed-road departure on the cobbled streets of Chester and Cav himself will be there to say hello. Entries cost £35 per person. Sign up at riseabovesportive.com.

farmhouses. Rocks tumble down the riverbank into the gurgling water of the mountain streams.

The light starts to dim as we are greeted with a fierce headwind and some light drizzle. Danny and I take it in turns to ride at the front to share the workload but we're both fading faster than the light. We arrive at the eerily quiet Llyn Brenig reservoir in the heart of the Denbigh Moors just as the rain comes down.

We could then have enjoyed a speedy dash to the town of Ruthin and passed the stark cliffs and wooded valleys of Loggerheads Country Park before arriving back into Chester. But, quite frankly, we're all cooked. Finishing the ride amid the fir trees that rise up either side of the silver water feels like a fitting end to the day.

As we savour the twilight views over the reservoir and reflect on the day's ride, I can't help but imagine Mark Cavendish smiling at the sight of a small gaggle of tired cyclists chattering about testing climbs and epic memories. *Mark Bailey is a freelance journalist who boasts similar power figures to Mark Cavendish (according to his latest gas bill)



f you sit back and wait for good luck, it won't happen – so you've got to provoke it,' says Stephen Roche. We put it to the 1987 Tour de France champion that, as well as the obvious talent a rider needs in the first place, luck must play a huge part in any Tour win, and he advocates actively trying to get it on your side.

Luck is a word often used in connection with the cobbled Classic Paris-Roubaix, but for riders targeting the Tour, faced with three long weeks of avoiding crashes and trying to arrive at the key mountain stages in optimum health, you need to do whatever you can to avoid misfortune.

'You have to try to stay out of trouble in the first week especially, as it's always mayhem. Whether we're talking 1987 or 2015, there are the same hazards at the Tour: traffic islands, roundabouts, big crowds... It can all go so wrong so easily, so you have to know where to position yourself in the peloton to try to avoid crashes – to make

'There's not a lot you can do to control whether a dog runs out in front of you'

your own luck a little,' Roche says. 'Crashes can happen anywhere of course, but you're more likely to be affected if you're further back than at the front.'

To even get yourself into a Tour-winning position, avoiding bad luck – from the first week to the last – plays a major role, the Irishman says, which is something that Team Sky boss Dave Brailsford would agree with.

'You can't manage the weather at the Tour, for example, but you can try to have the right clothing for it – for extreme heat or extreme cold,' Brailsford tells *Cyclist*. 'But then there's not a lot you can do to control •



How to win the Tour de France

Does the strongest man win, or the smartest, or the luckiest? There's no easy recipe for success at the world's biggest race, but there are two men who know more about it than most: 1987 Tour champion Stephen Roche and Sky team principal Sir David Brailsford...

Words **ELLIS BACON** Illustrations **STEVEN MILLINGTON**





• whether a dog runs out from the side of the road in front of you.'

We almost suggest carbon fibre dog deflectors, but don't want to interrupt.

'So you have to accept that you're never going to be able to control all of the variables, which means that in your planning for the Tour you have to pick a team that's made up of guys who are resilient, who can think on their feet, can adapt very quickly, who are really robust characters, and who are very dynamic in terms of being able to handle the difficult and unexpected situations that will be thrown at them.'

Utrinque Paratus – 'Ready for Anything' – is the British Parachute Regiment's motto, and it would appear to apply perfectly when

'You never win the Tour on one day – you win it as a result of being consistent and competitive every day'

picking your nine-man Tour team. But there are limits to the control you can have over something as changeable as a bike race.

'I think there's a bit of a myth that the riders basically ride their bikes and the sports director sits in the car behind them telling them what to do,' Brailsford says. 'That's just not how it works.' Ahead of each stage there will be a discussion about the ideal strategy and tactics to employ according to what's happening in the race, Brailsford says. 'But that's something that will change all the time, so the riders have got to be able to make decisions for themselves on the road. And you've got to keep it in perspective – the Tour is a bike race like any other, so when you ask a professional athlete, "Can you do your best? Can you be a good team player? Can you manage your attitude? Can you give your all?" they'll all say yes.' What they actually do is less predictable.

'It's Stephen Roche!'

Stage 21 of the 1987 Tour will be remembered both as a day that Stephen Roche gave his all and for what are arguably the most famous lines ever uttered in cycling commentary.

'Just who is that rider coming up behind?' wondered Phil Liggett. 'Because that looks like Roche. That looks like Stephen Roche... It's Stephen Roche!'

Roche had dug deep (so deep that he required an oxygen mask at the finish) to peg back rival Pedro Delgado, who had left the Irishman for dead lower down on the final climb of the day, La Plagne. But Roche doesn't see it as the day he effectively won the Tour.

'It was the day I didn't lose it!' he laughs.
'I could have lost it. It all could have gone wrong that day. But you never win the Tour on one day – you win it as a result of being consistent and being competitive every day,

IF YOU CAN'T BEAT'EM

...you could always cheat

SECOND FIDDLES

Winning the very first Tour in 1903 is an achievement of which France's Maurice Garin could be rightly proud. Less so finishing first again the following year, but getting disqualified for having taken a train for part of the route. Garin's brother. César, who'd finished third, was also disqualified, as were runnerup Lucien Pothier and fourth-placed Hippolyte Aucouturier, who it was alleged had held corks in their mouths tied to strings that were tied to the backs of cars. Victory went to the fifth-placed finisher, 19-yearold Henri Cornet, who remains the race's youngest winner.

TAKING THE PISS

What might have been for Belgian rider Michel Pollentier at the 1978 Tour. He won the 16th stage from Saint-Etienne to Alpe d'Huez, which also gave him the lead. But having been called for a dope test, he tried to cheat it with an elaborate system – actually, not that elaborate – involving a container of somebody else's (clean) urine under his arm, and a tube to his shorts. But he was caught and disqualified.

THROW THE RACE

If you're not cut out for winning the Tour, stage wins are the next best thing. In the cut and thrust of the sprint for the line, thrown elbows are all too common – anything to gain an advantage – but sitting up to throw your water bottle at someone who's annoyed you isn't going to go unnoticed. Tom Steels thought he'd give it a go anyway in 1997. The Belgian was furious with Frenchman Frédéric Moncassin, and decided to demonstrate just how much by letting fly with his plastic bidon - and was subsequently chucked off the race.







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• and then hoping that, if you do have an off day, that it's on a flat stage, or on a rest day, so that at least it's going to have the least impact possible on the general classification.'

While after that La Plagne stage Delgado remained in yellow, with Roche 39 seconds in arrears, earlier in the race Roche had already worked out that if he could stay within a minute of Delgado ahead of the final time-trial in Dijon (on Stage 24), winning the Tour would be a possibility.

'After the first half of the race, I'd quickly identified that my main rival was going to be Delgado,' Roche says. 'I knew that he was better than me on the climbs, but that I could beat him in a time-trial.'

The day after his efforts on La Plagne, Roche attacked his rival on the descent of the Col du Joux-Plane on the way to the finish in Morzine, clawing back 18 seconds and cutting Delgado's lead to 21 seconds.

'I reckoned I could put a minute into him in the final time-trial – me on a normal day,

him on a great day - and I ended up putting 61 seconds into him, so I wasn't far wrong,' says Roche, who took the yellow jersey and a 40-second advantage to Paris. 'So you've got to know your opposition - know what they're capable of, their strong points, their weak points, and work out from that where you can gain time. And you can only really calculate that once you've been over the circuit, or know where you're going. I'd done recces of both La Plagne and Morzine, I'd been over most of the crucial climbs beforehand - the Madeleine, Alpe d'Huez. I knew the difficult sections of the climbs, I knew the time-trial routes. So I basically knew which sections of the route favoured me, and which would go against Delgado.'

The march of time

But does winning the Tour in 1987 bear any resemblance to winning in 2015? Most of the same rules apply, says Roche, but the big difference is in the tools available to today's

riders. 'Everything's changed: the bikes, the components, materials... That whole aspect of the sport has totally changed,' Roche says. 'A top-of-the-range bike in my day might have cost, say, £2,000; now it's £15,000-£20,000, and it's doing the same job, but going that much faster because of aerodynamics, and because of the components being lighter and stiffer. And that's without mentioning riders having their own pillows and mattresses, and their diets, and the team buses...' he trails off. 'There had been a lot of changes before Team Sky came on the scene, but in the last five years the sport has moved on more than it had in the previous 15 or 20 years.'

For Brailsford, those five years – between Sky's first crack at the Tour in 2010 and his preparations for this year's Tour – have also brought new approaches not just in terms of equipment, but also in attitude.

'I think that the thing you get with experience is that you understand the need for a... calmness,' he says, having



'You don't think about whether you're going to win or lose, because that's pure emotion. You focus on the stage, and on being the best you can be'

found the right word. 'That calmness is something you really need in a three-week race: knowing when to push on in terms of energy expenditure and knowing when to hold back – just being a bit more aware of playing the long game. That's certainly something that's come with experience, and I think we're a lot less intense now than we were in 2010, if I'm honest.

'You've got to get better and learn all the time, and you've got to adapt,' Brailsford adds. 'This year, for example, there's no long time-trial, so you know you don't need to train for that, and can instead think about putting much more focus on the team time-trial, and trying to get that right. But what you can't do is control your rivals. You need to be mindful of your competition and how you can beat them, and think about that carefully, but equally I don't think you need to be worried about it.'

Game plan

In 1987, Roche knew in advance that he'd be able to gain time on Delgado in the final time-trial, and so factored that into his race plan, which nevertheless was always changing on the fly. Fundamentally, both Roche and Brailsford agree, winning the Tour is about identifying, and then trying to act upon, the points of the race at which time can be won or lost.

'We know that people gain time in the timed events – the team time-trial, and the individual time-trial and prologues,' says Brailsford. 'Next, we know that the best climbers will tend to gain time in the mountains. And then you've got the other elements, like the cobbles, like the crosswinds – the "Classics aspects" of the Tour – where there's also an opportunity to gain or lose time.'

The key, says Brailsford, is to identify which sections of the route suit which riders – both your own riders and their rivals. •



1 think Chris Froome is as good a climber as he is a time-triallist, and when he won [in 2013], it was on quite a balanced route. A time-trial-heavy Tour, on the other hand, would always suit Bradley Wiggins, who's a brilliant climber, but an even better timetriallist. So when you look at this year's Tour, you think, "OK, what's going to make the difference this year - what will it take to win?" and you analyse the critical factors. First, there's a prologue time-trial, and people are going to lose a bit of time there. Then you've got the crosswinds in the first week, and the cobbled stage, so you have to be very vigilant there; and the Mur de Huy, where time could be gained or lost.

'Then we've got the team time-trial, which is very interesting this year in so far as the last 1.7km is uphill, so you're only going to be as good there as your fifth guy up that hill. It's not your best climber or your fastest time-triallist – it's your fifth guy up that hill, and that's quite odd, really. So that's peculiar to this year's Tour. And then there's no lengthy individual time-trial, but you've got six mountain-top finishes. So they're basically all the key elements of this year's Tour, and that's how you start to think about it in your planning and preparation of how to

approach it, and what kind of team to build around your leader – what kind of strategy and game plan you'll put in place.'

Planning is everything – basically ensuring that you have the right tools for the job – but, once the racing is underway, you then have to think about things one day at a time, Brailsford says.

'If you're doing a hurdles race, you don't think about the eighth hurdle when you're jumping the second one – otherwise you'll trip over that second one. You jump one hurdle at a time, and think about that eighth hurdle when you get there.' He adds that the best approach it is to think about the process, and not the outcome.

'You don't think about whether you're going to win or lose, because that's pure emotion,' he says. 'You focus on the stage, and on optimising your chances of being the best you can be. Ultimately, that's it. The world of sport is a cruel one. There is no guarantee – no guarantee at all – that you're going to win the Tour, so you have to just try to be the best you can be. And if someone else is better... Well, that's just the game we're in.' *

Ellis Bacon is a freelance journalist who produces his articles with a mixture of planning, experience and blind luck

WINNER BY ANY OTHER NAME

In France especially, you don't have to win in order to be the fans' favourite

RAYMOND POULIDOR

Poulidor never won the Tour, and was nicknamed 'The Eternal Second' as a result, even though he actually only came second three times – and third five times – which isn't bad going if you ask us. Everyone loved 'Poupou', and he can still be seen each year at the Tour, now 79, working (somewhat ironically) for yellow jersey sponsor Crédit Lyonnais.

THOMAS VOECKLER

Despite his myriad facial expressions – think tongue out, puffed-up cheeks – Frenchman Voeckler manages to be adored by French housewives up and down the land. The men quite like him, too, thanks to his attacking riding and often suicidal breakaways. He's actually managed to win four Tour stages along the way, and has spent two lengthy spells in the yellow jersey, although coming anywhere close to winning the race overall has always been well out of his reach.

RICHARD VIRENQUE

An honourable mention here (although he wasn't very honourable) for Virenque - the original French housewives' favourite - who was chucked off the 1998 Tour with his Festina teammates. That year, he was genuinely in with a shout of winning overall, and may have done so had it not been for the pesky stash of drugs found in team soigneur Willy Voet's car boot. Virenque maintained his innocence for years, but his star finally fell when, in 2000, he admitted to having been a doper all along.





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f you don't master the manufacturing, you don't grow. If you're just a designer and sending some drawings to a company you're hardly involved with in the Far East, you lose your soul and lose the reason you are...'

So says Jean-Claude Chrétien, general manager at French bicycle manufacturer Look and part-time philosopher. His profound musings on national identity are lacking a certain gravitas, however, as *Cyclist* is currently at the Look manufacturing facility in Tunisia, northern Africa.

Look, the brand known for its pedals, its Mondrian-inspired team logo and its sinuous frame shapes, resisted the lure of the Far East, but commercial pressures meant it couldn't stay in the motherland.

'We needed to find a better price on our product from a manufacturing point of view,' Chrétien says. 'I was charged with finding which countries might be the best for production. At the time it was popular to go to Eastern Europe such as Romania [like Mavic]. But we came to the conclusion that Tunisia would prove more rewarding.'

While Look's pedals continue to be manufactured in Nevers, France, the company moved production of its frames and forks to Tunisia in 2000. Perhaps it shouldn't come as a surprise: France is Tunisia's main export and import partner, and was colonised by France between 1881 and 1956. It's why a significant percentage of Tunisians are French-speaking, especially the older population.

'Also, whereas delivery time from Asia is up to eight weeks, we can ship from Tunis to Marseille in a weekend. It's only a two-hour flight from Paris,' says Chrétien.

Look has always done things differently. Take its latest premium road frame, the 795 Aerolight. The gently ascending top tube flows into the stem with the ease of Quintana climbing Alpe d'Huez, which you can adjust from 17° to -13° depending on your aerodynamic bent (that's the Aerostem, not Quintana).

'It also comes with or without integrated brakes, integrated cable routing and integrated seatpost,' says



Chrétien. 'We're big on integration.' As integration is forecast by many experts to be the future of bike design, you could argue that the 795 is ahead of its time. Then again, there's always been a bit of the futurist about Look...

Born on the slopes

Look was founded in 1951 in Nevers, a commune in France built on iron and steel, shoes and fur. It originally made ski equipment, producing bindings for boots under its own name or for manufacturers such as Rossignol and Dynastar. In 1984, it applied that spring-loaded binding technology to the world of two wheels, inventing the world's first clipless pedal.

A year later, Bernard Hinault, a man renowned for seeking the extra technological edge, became the first Above: French technicians regularly fly over to Tunisia in the name of quality control

Below: Cutting carbon sheets is done via a mix of modern machinery and oldschool workforce

Top right: Each part is individually wrapped before the most experienced workers fix the silicone tubes together to create, in this case, the carbon front triangle cyclist to win the Tour de France using a pair of clipless pedals. Little did he know at the time, he was also claiming the honour of becoming the last Frenchman to win the Tour.

In 1986, Greg LeMond and Hinault finished first and second at the Tour, racing for the La Vie Claire team. The team was owned by raconteur and businessman Bernard Tapie, whose portfolio also included Look (before he sold up to Ebel Watches in 1989). It meant LeMond rode to glory on Look's KG86, one of the first carbon fibre bikes to hit the market, although it turned out that the carbon fibre tubing was actually created by another French company, TVT.

Chrétien says, 'The geometry of the frame used by Greg LeMond was designed by Look. We had an agreement with TVT for the supply of tubes and forks, but the machining, fittings and finishing were by Look.'

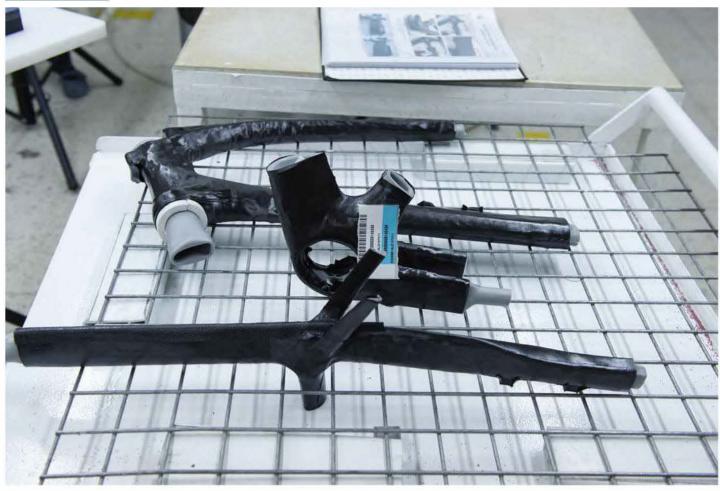
Look's quest for innovation, aerodynamics and lightness has seen numerous pro teams ride its bikes. Its 595 Pro Team Edition helped Thor Hushovd (Crédit Agricole) to victory at Stage 2 of the 2008 Tour; Laurent Jalabert secured his second King of the Mountains in 2002 (CSC) riding a Look, as did Richard Verinque eight years before (Festina).

It was the company's partnership with Hushovd's team, Crédit Agricole, ♡









• that proved the strongest, lasting from 1998 to 2008. The team featured such luminaries as Jens Voigt, Stuart O'Grady and, briefly, one Chris Boardman, who's still a fan.

'Look's new 795 is quite bold,'
Boardman says. 'They've put bars,
forks and other bits all in one piece in
quite a flowing way. Integration is the
future. I love the fact they thought
outside the box, but whether people
will invest in it, we'll have to see.'

Priced out of the WorldTour

Thinking outside the box unites Look and Boardman – as does a lack of current partnerships with WorldTour teams. Until 2014, Look had sponsored Cofidis, who were demoted to Pro Continental level at the end of 2009. Historically, French Pro Continental teams are at the front of the queue for an ASO wildcard entry so, via Cofidis, Look was near-guaranteed a place on the Tour, without having to pay the big money to sponsor a top-flight team.

Cofidis are there again this year, but it's another French wildcard, Bretagne-Séché Environnement, whose chamois will be sitting on Above: Silicone tubes provide the foundation for the different tube shapes that comprise a bicycle frame

Below: Technical components such as Look's own Zed crankset are also made in-house using monocoque design Look's bikes. General manager Emmanuel Hubert has said they are aiming for their first stage victory and a top-15 finish. It's a similar goal to many of the so-called weaker teams but is worlds apart from the days of Hushovd and Jalabert.

'Times have changed,' says
Chrétien. 'Once, supplying bikes for
a WorldTour team was enough of a
commitment. Now, it's bikes and a
cheque.' When you consider Look
produces between 6,000 and 10,000
frames a year compared to 6.3 million
at Giant, you can see why Look is
reliant on a wildcard. •



PRO VICTORIES

Big wins for Look frames

LEMOND SLAYS THE BADGER

The 1986 Tour de France witnessed a battle between the two stars of La Vie Claire: Bernard Hinault and Greg LeMond, who'd supported Hinault in his quest for a fifth Tour de France title 12 months before. LeMond eventually won, using Look's KG86 carbon bike.

JALABERT THE BRAVE

In 2002 Frenchman Laurent Jalabert won his second mountains classification at the Tour de France on a Look. He also won the combative award for a series of breakaways, and retired that year with a reputation as one of the bravest riders in the peloton.

HUSHOVD BAGS A BRACE

Despite not winning a stage, Norway's Thor Hushovd won the 2005 Tour de France green jersey – and a year later he ended that stage drought when, aboard Look's superlight 585, he stormed to victory down the Champs-Élysées.



















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• 'Sponsoring a WorldTour team can run into the millions,' adds Chrétien. 'But I'm happy with Bretagne. They're really good with the media – they can relate to the fans and are accessible. In fact, they're the opposite to Sky. That team have so much money, they're like a football team.

'Cycling has moved on. I remember Paris-Nice one year when I worked at Look bindings. One of the stages started in Nevers. All of the riders, like Stephen Roche and Sean Kelly, were siting around in our factory, drinking coffee and chatting to journalists and staff. You just wouldn't get that now.'

Look doesn't see everything through romanticised sepia lenses, however. When I ask about pedals and team sponsorship, media officer Audrey Sogney stresses that no money changes hands. Chrétien's gaze to the ceiling suggests otherwise. What's not in dispute is that 50-60% of the WorldTour teams use Look's pedals, including Tinkoff-Saxo and Movistar. But Cyclist isn't here for pedals – we're here for bikes...

Carbon masterclass

Unlike its French contemporary Time, which weaves carbon fibre, Look takes delivery of its carbon in rolls of preimpregnated sheets. These are stored in a -18°C fridge, the roof of which you can see when visiting the little boy's room – along with a rusty old bike and rows of lemon trees.

Chrétien runs through a PowerPoint presentation on the different types of fibre Look uses. Usually a PowerPoint is my cue to take a nap, but this one is actually interesting, and I even find myself taking notes.

Carbonisation between 1,000-1,050°C results in a fibre that's 90% carbon and 10% oxygen. This is high

resistance (HR) and is characterised by a slightly less rigid feel. If you crank the furnace up to 1,500°C, each fibre will comprise 99% carbon. This is high modulus (HM) and is almost double the rigidity of HR.

'We also use IM, which is intermediate modulus,' Chrétien adds. 'It takes around 30 tons to break IM, compared to 24 for HR and 40 for HM. But HR elongates better than HM, so we always use a mix.'

Just when I'm punch drunk on acronyms, Chrétien unleashes his carbon uppercut: 'In our company we use 3K and 1.5K for the woven fabric, which adds structure as well as a nice aesthetic. For UD [unidirectional], we use 12K and 24K. This is the number of filaments in each fibre and adds stiffness and strength.'

Impregnated sheets will always lack the charm and allure of Time's milling process, but Look does have control over the resin content. This can reach up to 40% when it comes to high modulus because, like a female panda, it's simply more difficult to impregnate. Look's creative R&D department in Nevers decides resin content dependent on component.

Epoxy resin is the Ernie Wise to carbon fibre's Eric Morecambe. It's the quiet catalyst to carbon's brash visage, its attributes adding strength to the carbon. Epoxy will continue to play the domestique but, in the future, its place could be under threat.

'We're playing with ecological fibres like bamboo, which could become more prominent for less stressful riding like in the city,' Chrétien says. 'These fibres are bonded with resin that derives from vegetables.'

Just as I'm pondering the physical and practical cycling benefits of beetroot, Chrétien opens the

LOOKING BACK A brief history of the French brand

1984

Look invents the clipless pedal. The following year Bernard Hinault uses it en route to his fifth Tour de France victory.

1986

Greg LeMond wins the Tour using a KG86 bike built by Look using TVT carbon tubes.

1990

Look lays claim to producing the first one-piece carbon frame.

2000

Look launches the first ergonomic road pedal, the CX 7.

2009

Look's Keo Blade is the first pedal to use a carbon blade instead of a traditional spring.

2010

Look 695 features three innovations: adjustable C-stem, Zed2 crankset and HSC7 carbon fork.

2014

Look launches the 795, claiming to be the most aerodynamic bike on the market. It's certainly one of the most integrated. factory door at Look Design Systems (the name for the Tunisian arm). Strip lighting illuminates rows of workstations and behind each one is a local woman, dressed in blue overalls and wearing traditional hijab. their white-gloved hands dexterously cutting, tying and measuring.

'They're working on different sections of the frames, in this case the 795,' Chrétien says. 'Here, for example, is the seat tube. She has a folder of instructions – her carbon recipe book - which she follows and wraps the sheets around this silicone tube. And that is key to our production and is unique to Look.'

The grey silicone tubes feature a polyamide bladder and are made by Look. Down the production line, these carbon-wrapped tubes are subjected to heat and pressure, which compresses and hardens the carbon. I'm introduced to the creator, part of the quality-control team that pays regular visits from France. I feel I should curtsey but am instead drawn to the hairdryers on each workstation. 'They're to make the sheets easier to work with,' says Chrétien.

I'm also drawn to a long spindle that looks like an ultra-thin aero handlebar, but actually turns out not to be for a bike at all. 'This is a new frame we're working on for a drone company in Switzerland,' says Chrétien. 'We're also testing another resin – after the epoxy and veg version - made from thermoplastic. It's being used in carbon cars and will become more prevalent in bikes.'

Out of Africa

As I scan the factory floor it becomes clear why Look makes its carbon frames in North Africa, All those elaborate shapes and innovative designs can't just be left to chance something Look feels would happen if it produced its frames in the Far East.

Take the Zed crankset. The spider, spindle and arms are forged from one piece of carbon, hence its Z-shape and name. At 320g, it's claimed to have the highest stiffness-to-weight ratio around. Armed with just a notepad, pen and dictaphone, it's not a claim I can verify, but the complexity of overlapping and wrapping numerous sheets of carbon certainly peels back •





fresh from the oven Left: Steel moulds are used to make the carbon parts

Right: This is what happens to clamps after years and years of resin abuse







the layers of marketing – this is one impressive bike component.

Quality control

Once each part has been finessed, the chief lady of the floor fits the tubes together to form the frame's front and rear triangle before sending the wrapped sheets off for hardening.

The light of the assembly room dissipates into darkness as we enter the machining floor. Men replace women. Noise replaces silence. Placed into steel moulds, the carbon-silicone combo is heated to 175°C and pressure increased to two bars, four, nine...

The frames are then treated to the carbon fibre frame refinement process, which focuses on sanding and sandblasting. 'Any defects, the workers can cure with epoxy resin,' says Chrétien. 'They then sand again. In fact, coating the frame in resin is a good way to ensure any pinholes in the frame are filled in.'

It's then into painting and decal with the occasional frame or component sent to Look's own test unit. Here, the team checks for stiffness and safety, as Chrétien

Above: Ventilation is key in the painting room

Left: Female workers are deemed far more dexterous than men

Below left: A 695 Aerolight takes shape explains: 'Let's take the fork as an example. First of all we push 100kg. Do nothing. Then we push 100kg again and measure the displacement in millimetres. It doesn't really impact with a material like steel but it's important with carbon because you have so many layers. If the layers haven't been compressed perfectly, when you add force you'll see delineation. It will move slightly and you'll have cracks inside. But that's extremely rare.'

I suspect it is. After seeing first-hand the manufacturing process, it's clear that Look is much more than aerodynamic shapes and head-turning componentry. The team in Tunisia is as diligent and proficient as you could find.

My early cynicism about shipping production away from French shores dissolves into the sunset and I can only agree with Chrétien: 'If you don't master the manufacturing, you lose your soul and lose the reason you are...'

James Witts is a writer who has never lost the reason he is, although he has occasionally misplaced it



A LITTLE BIT OF CYCLING APPAREL HISTORY

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The first



With the world's greatest sporting spectacle looming, Cyclist asks itself just how hard was the inaugural Tour de France in 1903? There's only one way to find out Words JAMES SPENDER Photography GEOFF WAUGH

t's 8.30 am, I'm on a flight to Lyon and I've just finished reading an interview with Sir Bradley Wiggins in Sport magazine. To close, the interviewer asks Wiggins for the best piece of sporting advice he'd received, to which Wiggins replies, 'I still come back to that thing James Cracknell said to me about rowing the Atlantic. The thing he learned from that was: no matter how hard something is, there's an end point. It always has to end. Whatever it is.'

As I re-read these words I begin to think they couldn't be more apposite. It's as if Sir Brad knows of my impending ordeal and has reached out in my hour of need. You see, 10 days ago the *Cyclist* office started musing about what it must have been like to ride a stage of the original Tour de France in 1903. Now, on a brisk Wednesday morning in June I've been packed off to France with a couple of maps and instructions to find out. On a single-speed bicycle. Oh my Wiggins.

It's on

Originally that first Tour in 1903 was scheduled to run from 31st May to 5th June, with six stages to emulate the six-day track meets that were

popular in France. But when only 15 participants signed up, race organiser Henri Desgrange was forced to move his event to 1st to 19th July, and halve the entry fee to 10 francs (£29 today).

With a minimal entry fee, plenty of scheduled rest days, and a total course length of just 2,428km – making it the second shortest course in Tour history (the shortest came the following year, at 2,420km) – it would be easy to assume it was a lesser challenge back then compared to today's Tours. But it was the stage lengths that made the first Tour altogether more menacing.

Stage 1, from Paris to Lyon, was a whopping 467km; Stage 2, from Lyon to Marseille, 374km; Stage 3, from Marseille to Toulouse, 423km; Stage 4, from Toulouse to Bordeaux, 268km; Stage 5 from Bordeaux to Nantes, 425km; and to round things off, Stage 6, from Nantes back to Paris, was a staggering 471km. To put that in perspective, the longest stage in last year's Tour was 238km. So which stage should we choose?

Stage 1 seemed like an obvious choice, but it quickly became obvious that 21st century Paris traffic would make the going slow and dangerous – and besides, it was mainly flat. Stage 2, on the other hand, included the •







○ infamous Col de la République climbing to 1,161m, and would hopefully offer better roads. Having agreed to tackle Stage 2, I needed to arrange some appropriate equipment.

In those days men were men and women were glad of it. Riders had a fixed-wheel bike with, if they were lucky, a flip-flop rear hub (a sprocket on each side, meaning the wheel could be removed and flipped around to provide a different gear ratio). They had to carry their own sustenance, spares and tools, and as a result the laden bikes would weigh around 20kg.

Since getting hold of a period bike was out of the question – those that still exist are in museums or private collections – I instead tried to emulate the essence of a 1903 Tour bike by opting for a steel Cinelli Gazzetta with a large Carradice seat bag for all my sundries. While riding a fixed-wheel was mooted, the health and safety people at *Cyclist* deemed it unsafe to be careering downhill with legs spinning like egg beaters, so brakes and a single-speed freewheel were insisted upon.

Slightly easier to replicate was clothing. Italian manufacturer De Marchi still keeps a healthy vintage line in its catalogue, so wool jerseys and corduroy plus-fours were ordered up for the occasion. I concede I also packed some padded bibshorts to wear beneath the cords, despite several colleagues decreeing I should shove a steak down my shorts like the old days.

Before leaving Britain, the decision over which I agonised longest was my gearing choice. The overall winner in 1903 was Maurice Garin, who completed the six stages in 93 hours 33 minutes, reputedly pedalling a 52-tooth chainring driving a 19-tooth sprocket. By my calculations that meant the 'little chimney sweep' as he was known (having been sold into the trade by his father, who exchanged the young Maurice for a wheel of cheese) was pushing around 73 gear inches. Not a lot when you consider a 53x11 set-up is around 126 gear inches, but huge in comparison to today's modern compact set-ups, where a 34x28 produces 32 gear inches. After various trials I opted for 48x18, two gear inches shy of Maurice, but enough I hoped for a happy medium between getting over the 14km long, 3.8% average Col de la République and being

The rider's ride

Cinelli Gazzetta, approx £1,100 as pictured; £349.99 frameset for the UK market

Depending on when you asked me, the review for this bike would have changed significantly. The first time I rode it, the track geometry felt unsettlingly harsh, but once dialled in - jacking up the stem and running the Vittoria Open Corsa SC tyres at just that little bit lower pressure - it became a lot more comfortable. Over the course of the ride, this 12kg machine (16.5kg laden) became my closest ally. Until the end that is, where unless it had a motor I would have hated any bike I was on. That said, I never fell out of love with the Carradice Barley saddlebag, and the amount of food, drink and extras it helped me carry. I'll be using it again.



able to spin along at around 95rpm for a 32kmh return. Well, that's the theory. Now all I have to do is put it into practice.

Bending the rules

With me today are Geoff, on hand to take pictures, and Steve, who will be driving him around. They are under strict instructions not to give me a lift, but they will have supplies for me - another anachronism in proceedings of course, as the 1903 riders were supposed to fend for themselves, which generally meant begging or 'borrowing' food. However, as an incentive to sign up for the race, Desgrange reportedly offered the first 50 riders an allowance of five francs per stage for sustenance, or about £15 in today's money. At any rate, I feel slightly justified in my car-cum-catering unit, as the old guard had a bit of a penchant for cheating too - in 1903 Frenchman Jean Fischer was caught drafting a car by one of Desgrange's 1,000 'flying squad' marshals who lined the roads and control points.

Unlike today, the rules at the time stated that anyone not completing a stage could still compete in the next one, but would forgo general classification contention, so it's curious to note that Fischer is still documented as finishing fifth in the GC, a mere four hours 59 minutes behind Garin. One man who wasn't so lucky, and who has become the focus for my ride, was the burly figure with the even burlier moustache – Stage 2 winner Hippolyte Aucouturier.

Nicknamed *La Terrible* by Desgrange for his outspoken ways, Aucouturier (whose surname comically translates as 'ladies tailor') was a favourite for the 1903 race after winning Paris-Roubaix earlier that year, albeit in some •





While riding a fixed-wheel was mooted, Cyclist deemed it unsafe to be careering downhill with legs like egg beaters



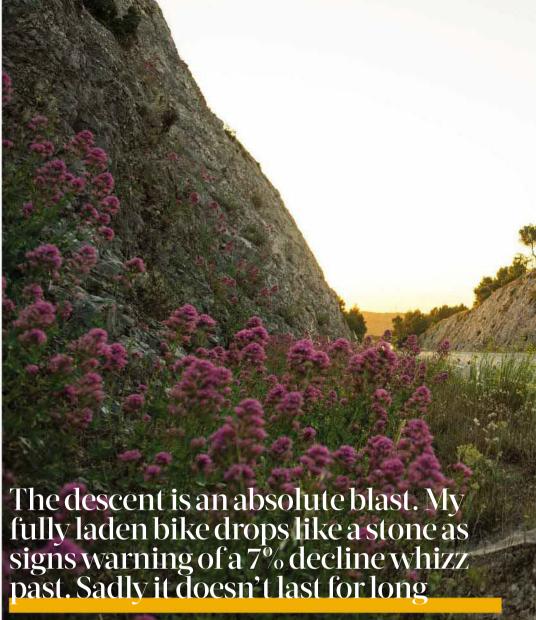












rather odd circumstances. As today, riders finished in the Roubaix velodrome, only then it was tradition to swap to a track bike for the final laps. Having chased down the lead group, Aucouturier suddenly found himself ahead when his fellow competitors, Louis Trousselier and Claude Chapperon, mixed up their bikes and proceeded to fight over whose was whose, leaving Aucouturier to win by 90m.

Unfortunately, he was forced to retire from Stage 1 with stomach cramps. Commentators suggested it was a mix of alcohol and the ether riders sniffed to numb the pain, but a more sympathetic explanation is that he wasn't over typhoid from the year before. However, three days later he was back on fighting form and took the stage I'm now about to embark upon in 14 hours 29 minutes. Hippolyte, here I come.

The not-so-grand depart

The history books state that when the riders left Lyon at 2am on 4th July they were cheered by every member of the city's cycling clubs, who turned out with bikes and lanterns to watch.

Tonight, however, in the Place Bellecour square, it's just me, a couple of screeching youths out past their bedtime and the disappearing lights of our car. As picturesque as it is riding down the street-lit banks of the Rhone and out into the French countryside, my overwhelming feeling of excitement has turned to fear.

Lyon's suburbs diminish almost as quickly as the street lighting, and soon the roads are pitch black. I'm not usually scared of the dark, but as I wend my way to St Étienne I can't help but dwell on the story about a mob from this area who attacked a group of riders in 1904 to further the chances of their home rider, Antoine Faure. Apparently the 200-strong crowd only dispersed when race commissaire Géo Lefèvre turned up and fired his pistol in the air. I don't think Steve managed to get his gun through customs.

As dawn breaks at 5am, trepidation is replaced by a sense of wellbeing. The smell of fresh croissants wafts through the air as I pass through tiny villages. Evidently the bakers around here started nearly as early as I did, and it's not long before I stop for a bite to eat.



Read all about it

How a political feud and a newspaper created the Tour

It's the end of the 19th century and a political fracas is gripping France. French Army officer Alfred Dreyfus stands accused of leaking secrets to the Germans and is convicted, despite questionable evidence. France is polarised, with notable dignitaries backing both sides. Then, at a horse race in Longchamp in 1899, things come to a head when a fight breaks out among the pro-Dreyfus 'Dreyfusards' and the anti-Dreyfusards. During the scrap the new French prime minister, Émile Loubet, is struck on the head with a cane by Jules-Albert de Dion, owner of De Dion-Bouton cars. De Dion is fined 100 francs and incarcerated for 15 days.

L'Velo, the most popular sports paper of the day, runs a story about the incident that so enrages De Dion that he sets about creating a rival sports paper, which is called L'Auto and is edited by ex-Hour record holder (at 32.325km) and joint owner of the Parc des Princes velodrome, Henri Desgrange.

Sales are poor, and on 20th November 1902 crisis talks are held. A young reporter, Géo Lefèvre, suggests L'Auto creates, sponsors and covers a six-day cycling event around France. L'Velo is put out of business a year later, while L'Auto becomes L'Équipe in 1946, and with the Tour de France becomes a worldwide bastion of cycling.

Fortunately for Cyclist there are no unruly mobs on hand to attack us, as there were for riders in the early editions of the Tour who dared to challenge the home favourites Taking stock of my surroundings, I'm pleased to note I've covered 65km already and am still feeling fresh. Less pleasing, however, is the thought of the impending Col de la République. It was this col, after all, that sparked the interest in and propagated the need for derailleurs, a component of which my bike is sadly bereft.

So the legend goes, Paul de Vivie, a writer who penned under the name Vélocio and also edited the brilliantly titled *Le Cycliste* magazine (great minds, Paul), was riding up the Col de la République on his fixed gear when one of his readers, smoking a pipe no less, overtook him. De Vivie mused that bicycles would do well to have more gears, and so set about developing the derailleur, which would evolve and later appear in production on his friend Joanny Panel's *Le Chemineau* bicycles in the early 1900s.

Despite the obvious benefits of multiple gears, Henri Desgrange prohibited them until 1936, and even then such systems were only to be used by privateer entrants (the first pro to win a Tour with a derailleur was Roger Lapébie the following year). In response to a demonstration in which female cyclist Marthe Hesse triumphed with a three-gear bicycle over male cyclist Edouard Fischer, who rode fixed, Desgrange famously wrote, 'I applaud this test, but I still feel variable gears are only for people over 45. Isn't it better to triumph by the strength of your muscles than by the artifice of a derailleur? We are getting soft. Come on fellows. Let's say that the test was a fine demonstration - for our grandparents! As for me, give me a fixed gear!'

It's a quote now running through my mind as I try to tackle the lengthy slopes of the Col de la République. With each grinding pedal stroke I find myself more at odds with Desgranges' attitude: 'As for me, screw the fixed gear, fetch me my 11-speed Dura-Ace.'

The top of the col is marked with a monument to De Vivie, and as I gratefully resume a normal rhythm on the flat I give him a ceremonial nod, and think how ridiculous I would look to him – all these years of bicycle development and here I am, making life unnecessarily hard for myself. Still, he'd be pleased I didn't get off to push.

The descent, however, is an absolute blast. My fully laden bike drops like a stone as signs warning of a 7% decline whizz past. This I can deal with, but sadly it doesn't last for long. The vast flatness of the French countryside awaits. Another 270km of just sheer grind.

So the story goes, when Garin finished that first Tour he was asked to give his thoughts to the press. But instead of the finish-line interviews we're now so fond of, Garin handed Desgrange a pre-prepared statement, which read as follows: 'The 2,500km that I've just ridden seem a long •



c line, grey and monotonous, where nothing stood out from anything else. But I suffered on the road; I was hungry, I was thirsty, I was sleepy, I suffered, I cried between Lyon and Marseille, I had the pride of winning other stages, and at the controls I saw the fine figure of my friend Delattre, who had prepared my sustenance, but I repeat, nothing strikes me particularly.

'But wait! I'm completely wrong when I say that nothing strikes me, I'm confusing things. I must say that one single thing struck me, that a single thing sticks in my memory: I see myself, from the start of the Tour de France, like a bull pierced by banderillas, who pulls the banderillas with him, never able to rid himself of them.' I know how he feels.

The finish

It's 10.30pm and I have finally arrived in a car park on the outskirts of Marseille. The only things in it are the broken fridge I'm sitting on and the dead cat I'm staring at.

It's unlikely this was quite the scene that greeted Aucouturier et al upon finishing stage two, but it's where my diligent mapping says the end is, and while it's probably wrong, I'm in Marseille and I've got almost 400km in my legs, so I don't really care. If it seems like I have skipped retelling the bulk of my ride to wind up here, there is a good reason for it, and that's because there is almost nothing to tell.

Like Garin, I too cried between Lyon and Marseille. I cried out in anger at this ordeal and in anguish at my feet, which felt like red-hot knitting needles had been inserted into them. Other than that, the only thing else remarkable about the 270km between Saint-Vallier, down the Rhone, through Avignon, Aix-en-Provence and to here, was that it somehow happened. Whether it's my brain deleting the painful memories or the fact my head was so slumped I barely looked further than a few metres ahead, I don't know. The only things that do appear strong in my mind aren't mental pictures, but overarching feelings. Somewhere in there I think I might find triumph, yet for the most part that feeling is swamped, but oddly not with thoughts of pain, but rather of bitterness and loneliness.

For the last 200km all I wanted to do was get off. It wasn't physically demanding, but soul destroying. I was alone, as many of the riders back then would have been, my efforts met with ever diminishing returns. The only respites were hailing down Steve and Geoff for more cold coffee or another ham sandwich, yet I knew the more I stopped, the longer I'd find myself riding. It was a mind-numbing blur that lasted 20 hours, with 15 spent riding. I guess I must have stopped more often than I thought.

For me it is over, but for those riders back then, they knew they'd have to keep on going for four more gruelling stages. So to them, to Maurice and Hippolyte, chapeau!

James Spender is staff writer for Cyclist and has not volunteered to recreate the 397km first stage of the first Giro d'Italia



It's over: after almost 400km and 20 hours of riding a heavy single-speed bike, Cyclist's arrival in Marseille is met with empty streets and a dead cat





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Disc brakes have arrived in the road bike market and will soon be in the pro peloton, but as *Cyclist* discovers, it may be still too early to invest in a disc brake bike Words JAMES WITTS Photography DANNY BIRD

ountain bikers have used them for years. Cyclocross racers joined the party about five years ago. Now it looks pretty certain the road market will follow. We are, of course, talking about disc brakes, and the past couple of seasons have seen an emerging sector of disc-specific bikes, which have become increasingly popular in the road market despite being currently banned from pro races.

The pros and cons of disc brakes have been much debated – better modulation and stopping power in the wet versus more weight and poorer aerodynamics – but even if you feel that discs are right for you, there are a number of aspects that need careful consideration or you could find that your new bike is obsolete before you know it. The problem is that the industry is still not in full agreement about which standards to follow, with rotor size, calliper fitment, wheel rim and hub development and, perhaps most critically, how the wheel should be attached to the bike all well and truly up in the air. With so much uncertainty, is now the time to make the leap, or would you be better to wait out the UCI trials and allow the industry to find its norms before handing over your credit card?

Thru-axle or QR?

More than 80 years ago, Tullio Campagnolo invented the quick-release (QR) skewer and this nifty contraption (or versions thereof) has become ubiquitous for fixing wheels to bike frames ever since. The rise of disc brakes, however, sees the humble QR under threat from a standard adopted from mountain biking: the thru-axle.

'We prefer the thru-axle because the alignment is more precise than a standard quick-release,' says Parlee •



Cycles' Tom Rodi. 'We've all managed to fit a wheel in our frames slightly crooked with a standard OR, and that's not an option for discs, as the pad clearances are so small. With a thru-axle you don't have that - it provides submillimetre accuracy.'

As the name suggests, thru-axles run directly through the dropout, unlike ORs that clamp into open dropouts. Mountain biking has shown thru-axles offer more predictable handling thanks to improved lateral stiffness, but there's a weight cost as they're bulkier than ORs. A RockShox Maxle Lite front thru-axle, for instance, hits the scales at 74g, compared to the Mavic Ksyrium standard QR at 52g. That disparity grows as you nudge towards the higher-end. Tune's U20 front quick-release skewer is a mere 10g. So there may be more than a 100g penalty just in the wheel attachment alone. The dropouts themselves also require more material to support a thru-axle, adding more bulk to your bike. One example is Paragon Machine Works' titanium rear quick-release dropouts, which weigh 60g a pair compared to a comparable thru-axle version at 91g.

Granted, we're talking tiny numbers here, but this is road cycling where riders will starve themselves to ascend a 20% gradient 10 seconds quicker. And, inevitably, thruaxle weights will come down if they become the standard over QRs. Actually, that's when, according to Specialized engineer Jeremy Thompson.

'The industry as a whole will transition to thru-axles,' he predicts. 'The real question is which axle diameter will become standard? Some frame makers are working with MTB standards - 12mm x 142mm at the rear, 15mm x 100m at the front. Others want to modify these existing standards to optimise the systems for road bikes. I think we'll see these disparate approaches result in a common standard over time. Until then, consumers will likely be presented with a confusing mess of non-standardised interfaces to choose from. But it will definitely be thru-axles.'

Thompson is confident thru-axles will become the norm despite being more of a hassle to use than QRs. On many models, a certain amount of winding/unwinding and pulling is required to release the thru axle. For recreational riders, that's not a big deal, but if - no, when - discs are allowed in the professional peloton, vou can't imagine Froome waiting patiently for a wheel change while his rivals steam off, and this could be a problem that will need to be resolved if discs are to succeed in the pro arena.

'I don't see that as a huge issue,' says Rodi. 'At the highest level, often they're swapping whole bikes. Also, a well-trained mechanic could still release the thru-axle pretty swiftly. I can't see how you'd lose a race because of a thru-axle.'

As it stands, Parlee offers both thru-axle and QR for its flagship Z-Zero Disc. 'We offer that service,' says Rodi, 'but in our eyes a OR is a rare order.'

So it looks as though thru-axles may win the day, but there is plainly a lot of work to do to bring the weight down

Reynolds is wary of wheels purporting to serve both rim and disc brakes. 'Serving two masters with and establish an industry standard. It's a similar tale when it comes to wheels... one tool isn't Are disc-ready wheels really ready? possible' 'The differences between a calliper and disc wheel are huge,' says Paul Lew of Reynolds.

'Yes, our initial designs simply involved small

modifications to the brake track area. But things have

moved on. We switched to a different shape and changed

calliper that drags on the rim requires different thermal

properties than a wheel for discs. Typically, the carbon

resin systems because one type of resin system for a

modulus for a rim brake is also higher, which can be



Discography

The lexicon of disc brakes

Hydraulic: Master cylinders in the brake lever contain a reservoir of brake fluid. Via a hose, this fluid flows to the calliper, where it drives against two pistons, one behind each brake pad, to force the pads out and against the disc rotor.

Mechanical: Works on a similar theory to hydraulic, but operated with metal cables rather than hydraulic fluid.

IS mount: 'International Standard' mount uses two drilled tabs that run parallel to the disc.

Post mount: Uses two threaded posts running perpendicular to the disc and a slotted calliper for easy calliper alignment.

Modulation: The relationship between the force applied at the lever and the force applied to the disc rotor by the brake pads. Good modulation equals good control and stable braking. Poor modulation means the brake feels very 'on-off' which is less predictable. Not to be confused with stopping 'power'.

Organic pads: Also referred to as 'resin pads', they're made from a ceramic and resin compound and provide more initial 'grab' and potentially superior stopping power, but at the cost of wearing out faster.

Sintered pads: Also referred to as metallic pads, these use a compound with added metal content, which is usually copper shavings. This means they're harder wearing than organic, and will heat up faster, but they do last longer.

Rotor: Centrally affixed to the reinforced hub and designed to a) stop the wheel and b) dissipate heat. Bigger rotors heat up less than smaller ones but come with a weight penalty.

achieved via more material or a high-modulus material. We do the latter because it's lighter.'

Lew is wary of wheels purporting to serve both rim and disc brakes due to the different stresses generated when exerting the slowing forces to the wheel at the rim compared to at the hub. 'Serving two masters with one tool isn't possible,' he says.

Lew also states that those different stresses have and impact on the direction of the carbon lay-up. It's technical stuff: 'Both rim and disc brake rims require fibres that are radial, annular and off-axis. However, there's a difference in construction. Rim brake rims need to contain more radial fibre placement ['spoke'

direction] and disc brake rims need more annular fibre placement ['hoop' direction].'

It's not just the carbon that needs brake-specific properties. Because the braking force from disc brakes has to be transferred from the hub through the spokes to the rim (rather than simply being applied at the rim) the wheel has to be stronger in this area too.

It's plain that a disc-brake wheel is a different beast to a rim-brake wheel, and that the arrival of discs has thrown up a number of problems for wheel manufacturers, especially when it comes to weight.

At last year's Eurobike trade show, French wheel producer Mavic unveiled its first disc wheelsets – the Aksium One Disc and Ksyrium Pro Disc. 'For us it wasn't a big deal because we've been making mountain bike disc wheelsets for years,' says Michel Lethenet, Mavic's global PR manager. 'But it's another constraint to reduce weight. You can't stick to 16 or 18 spokes, plus you also have to lace the wheel differently to reinforce the construction of the wheelset because of [high] torque forces when you apply the brake.'

Compare the Aksium One at 1,825g without tyres and the disc version at 1,965g. That's down to the extra spokes – 24 front and rear on the disc version compared to 20 on the calliper. At present, disc-brake wheels need to be overbuilt to cope with the additional braking forces, leading to a weight penalty, but the potential benefits of disc brake wheels are vast. Losing that brake track means rims designed for discs can maintain an aero profile all the way to where they clinch the tyres, which could significantly improve aerodynamics. Also, the loss of the aluminium brake track or heat-resistant resins on carbon brake tracks could mean the weight of the wheel is focused at its centre instead of its outer edge, making for a faster accelerating wheel.

So disc-brake wheels are not as good now as they will be in the near future, but they'll improve as soon as the frame and wheelbuilding industries agree on some standards. As Lew puts it, 'I can make a wheel that might have outstanding dynamic performance because of an innovative shape, but because there are no industry standards right now, it won't fit in every frame.'

Big or small rotor?

Another detail of disc brakes that divides manufacturers is the optimum rotor size. The choice currently seems to be between two sizes: 140mm and 160mm. The larger the disc rotor, the greater the potential stopping force, and a larger rotor also offers more surface area to dissipate heat, which would favour 160mm rotors. The downside to a larger rotor disc is extra weight, and the impact it has on the aesthetics of a sleek-looking road bike.

'We recommend 160 for road discs,' says Zipp's John Balmer, 'with maybe a 140 option for cyclocross. We don't recommend using smaller.'

Innovations are out there, however, that offer a peek into the future. Shimano's RT99 rotor features cooling fins that claim to reduce its working temperature by 50°C. The back plates of the brakepads are finned too, purportedly losing another 50°C. So you can be sure •



materials and designs to challenge the current norms in the coming years.

the prices and You can also be sure that the industry will be looking at the aerodynamic inventory down' performance of disc rotors. Minimal windtunnel results have been included in the marketing literature to date, but independent testing carried out by respected US cycling website Velonews shows that the rim brake version (using Di2 levers) of the Specialized S-Works Tarmac is faster than the disc version (R785 hydraulic levers) in all wind angles, with the disparity increasing as the wind moves from left to right (discs are on the left). That will certainly have to change if the pros are to adopt them over callipers.

Going pro

Disc brakes are banned for the pro peloton – but not for long

Disc brakes are a unique phenomenon in cycling – they've reached the market from the bottom up. That means the masses have driven innovation rather than discs being a trickle-down innovation of the elites. The reason? Despite disc brakes being legal in mountain bike racing and cyclocross, they're banned from the pro peloton. The reasons, UCI technical collaborator Johan Kucaba told us last year, were many: 'The challenges to be resolved compared to cyclocross and mountain biking are many. They include higher speeds, longer braking time, higher temperature accumulation, bigger discs that could cause safety issues and difference of braking performance between discs and rims that could cause crashes inside the peloton.'

However, times are a-changing. In mid-April this year, the UCI announced that tests will begin this season and that all professional teams will have the opportunity to use bikes with disc brakes at two events of their choice during August and September. 'The testing will carry into 2016 at all events on the UCI professional road calendar,' the statement continued. 'If the experience is satisfactory, disc brakes will be officially introduced to the UCI WorldTour in 2017.'

How the brake callipers attach to the frame is also yet to be standardised. A year ago, there were two standards: the 74mm post mount and 51mm ISO mount. Then Shimano rolled out the flat mount, which certainly provided a sleeker appearance and is likely to improve aerodynamics too. Time will tell how many frame manufacturers will adopt this new brake mount.

Weighting game

One thing everyone agrees on is that discs must become lighter. Depending on the brand and rotor sizes, disc brake systems can add several hundred grams over traditional calliper models for reasons we've already examined, which clearly won't endear them to the professionals.

> Parlee's Rodi points out that most manufacturers are designing frames and wheels that already require team mechanics to add weight to stay above the UCI minimum weight limit of 6.8kg. But as well as discussing - and testing - disc brakes for the professional peloton (see 'Going pro', below), the UCI is debating whether it should lower the 6.8kg limit. If it does, it could halt disc brakes' progress in its tracks.

Or, according to Lew, it could change the way professional cycling is raced: 'I can see things turning more like Formula One, with GC riders making "pit stops" and changing bikes multiple times in a stage so they can descend at the fastest speed with disc brake bikes and ascend at top speed with the super-light calliper brake. It would make for exciting racing.'

It's possible, but without industry standards in place by 2017 - when disc brakes will provisionally be allowed in the professional peloton – it could prove a nightmare for neutral service mechanics in the big races. Those canary yellow Mavic service cars in the Tour are laden with bikes and wheels as it is. They'd need a dumper truck to cope with the variety of mounts, axles, wheels...

Mavic's Michel Lethenet says of the lack of industry standards, 'If it's the same mess as mountain bikes when they went disc, it will be a challenge to keep the prices and inventory down. More systems, more problems with compatibility, more cost. There will also be more spare parts for retailers to stock and more machining for us... the cost will be higher for everyone. But let's see what the future holds.'

So the question remains: should you make the transition to discs now? There's a strong argument that the major bike manufacturers are making disc-ready frames and wheels that do a specific job, so why wait? Then again, if you're umming and ahhing, it may pay to see what comes from the introduction of disc brakes to the pro peloton. The UCI and the bike industry will near-guarantee that there will be standards in place come the potential date of discs' entry into the WorldTour in 2017. Whether your itchy credit card can wait that long is another matter... & James Witts is a freelance journalist who is considering switching to discs, just as soon as he's sold all his vinyl

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ourism is a funny thing. It's obviously great for the tourists, but for the locals it can lead to a mixture of success and sadness. Success at the money brought to their local

economy; sadness at what gaggles of strawhatted aliens take away with each click of their cameras, by their very presence changing the feel of the landscape. The Mallorcans, however, don't seem to worry so much – the very road I'm about to try and conquer was built expressly to serve the passage of tourists.

That road is the Carretera de Sa Calobra, which winds its way over 26 hairpins from sea level to the top of Coll del Reis at 686m, and on to Mallorca's interior. Built in 1932 by Spanish civil engineer Antonio Parietti Coll, the Sa Calobra, affectionately known by many as 'The Snake', wasn't designed to connect the then 32 inhabitants of Port de Sa Calobra with the rest of the island, but rather to make it easier for the holidaymakers to get down to this tiny, picturesque port village on Mallorca's north west coast. In all, some 31,000 cubic metres of rock and scree were reckoned to have been excavated - by hand, no less - to make way for the road, which over the years has fulfilled its brief many times over, allowing thousands of coaches to ferry hordes of visitors over the mountainous terrain.

David Lopez, at 24m59s, averaging 22.7kmh. He rides for Team Sky so there's little wonder, but still, as I queue for race registration, I can't help but set myself the fanciful target of maintaining a 20kmh average.

I'm not normally one for Strava bashing, but I have to admit I've been studying the Sa Calobra leaderboard since I entered this sportive. I want a good time, but never having ridden a time-trial, let alone one that just goes uphill, I have no idea how hard to push or how to measure my efforts. This, of course, is one of the key weapons in any successful time-triallist's armoury, and one that Wiggo deployed to devastating effect when he took the rainbow stripes in the World Time-Trial - just how hard should I ride and when? After all, I don't want to blow up before the end, but equally I don't want to finish knowing there's more left in the tank. Thus I've decided to reach for the stars and touch the sky - or in other words, set myself a goal that's so unrealistic I shan't feel disappointed when I miss it.

A 20kmh average is the target, but I concluded that if I can average 16kmh I'll be happy and, by my reckoning, safely inside Strava's top 1,000. Strange how our human brains find round numbers so important.

By the numbers

Not only is the Sa Calobra TT a cycling event, it also encompasses a timed hill climb for those who are fleet of foot. Even the slowest riders

By the time the Tannoy calls my name and number, my knees feel like jelly and my sunglasses are steaming up

Yet today there won't be a coach or any other motorised vehicle in sight. The Sa Calobra has been closed for the first time in living memory, and for a few hours it will be given over to the people who worship it most: cyclists. The event? The inaugural Sa Calobra Time-Trial sportive.

Cigarettes and alcohol

'There's a fair chance Bradley will be up here in the next couple of weeks,' says our host and road-closing instrumentalist, Dan Marsh. 'He'll be back to Mallorca for a party at some point to celebrate his end of season and world champs TT win, no doubt with a few beers and a cheeky ciggie!' Even full of booze and smoke, one would imagine Sir Wiggo would place pretty highly among the 14,800-strong list of Strava-logging cyclists who've tackled the Sa Calobra. Currently the record for the official climb is held by one

should be within the hour mark for the ride, but the runners, I'm told, will be doing well to come in under twice that. Sitting on the crossbar of my rented Cervélo S3, the sun creeping ever higher in the morning sky and beating down even harder on my back, I'm glad I'm in cleats, not trainers. That said, there are quite a few serious types lurking on their bikes who are making me nervous. I reccied the course the night before, partly in a car, partly on my bike, but still these guys look like they know Sa Calobra intimately, and I begin to worry.

Rollers have been taken out of car boots, and well-drilled partners are pinning race numbers to jerseys, fetching coffees and knowing not to talk too much to their highly concentrated other halves. A couple have clip-on time-trial bars on their expensive race rigs, making me wonder if I should have done the same – every little









helps, I muse, wondering if perhaps Brailsford's marginal gains was a eureka moment while watching a Tesco advert.

As we're ordered to form a queue by the start official, to be set off at minute intervals, I take the last few moments of calm to set my Garmin to just display distance and average speed. Nothing else matters. My time will be what it will be; top speed an inconsequential metric. It's averages that will count here. Shoot for 20.

By the time the Tannoy calls my name and number, my knees feel like caffeine-injected jelly and my sunglasses are beginning to steam up. As they say, time-trials are the race of truth - just you, your abilities and the clock - and I'm feeling that pressure. Then honk! I race out from under the gantry to a ripple of polite cheers, determined, if nothing else, not to be passed by the minute men and women behind me. •

The details

Take on one of Europe's most iconic roads, traffic-free



What Sa Calobra TT Where Mallorca, Spain Next one 3rd October 2015 Distance 9.4km; max gradient 27%; average gradient 7%

Price €50

Sign up ttsacalobra.com Fastest time 2014 Daniel Coll (m), 26m18s (22.8kmh); Katie Handyside (f), 45m17s (13.2kmh)

Cvclist's time 2014 33m01s Slowest time 2014 Federico Oetinger (m), 50m42s (11.8kmh); Aina Martinez-Atienza (f), 51m24s (11.7kmh) Description of the first hairpin is only 20m away, but despite the adrenaline coursing through my veins, it seems to take an age to come, and even longer to negotiate. I feel like I'm going so slowly I can pick out every little leaf lining the side of the road, every glinting chunk of black tarmac passing below me in infinite detail. What's wrong? Have I punctured already? Am I in some ridiculous gear? Yet before I can look down to find any mechanical element to blame for this sluggish departure, the road flattens out and I quickly find myself changing up as I spin out my gear. Bike OK? Check. Me? To be confirmed.

After yesterday's recce I decided to break the Sa Calobra up into three parts. The first, ending just after the road makes its way through a silvery gash in the mountainside at 3km; the second the relatively straight drag as the trees thin and the road becomes more exposed until 6km; the third the relentless, twisting hairpins that eventually crest the summit. While the overall gradient is a 'mere' 7%, that figure belies the ramping quality of the Sa Calobra. Barring

The giant chasm of rock through which the Sa Calobra threads passes by in a whirlwind of head-down pain

the higher gradients at the apexes of hairpins, the first few kilometres are gentle enough to leave you wondering what all the fuss is about, before they steadily increase as the road presses on. I'm determined not to be lulled into a false sense of security and overcook things, but I'm also keen to push a fair pace up these preliminary slopes to offset slow speeds that will inevtiably come nearer the top. I look at the Garmin. It seems to be working. Twenty-two.

Chase is on

I was once told as a rule of thumb that when riding at under 20kmh, 20% of the opposing force comes from air resistance and 80% from rolling resistance – energy lost through the tyres. Over 20kmh those percentages reverse, so besides concentrating on my breathing, I try to hold a relaxed yet purposeful TT tuck, with









as flat a back as I can manage, hands balled like fists on the top of the hoods and elbows bent at 90°. Whether this is that efficient in reality I don't know, but I'm feeling fast. I'd go as far as to say I'm feeling rather good. I can even hear something I don't think I've ever encountered on a climb before – the sound of air on this otherwise perfectly still day rushing past my ears. Looking up, I'm buoyed even more as I catch the glint of a wheel up ahead disappearing round a corner. What do you know – I might even catch my minute man at this rate.

As commentators will often say of the pros, losing sight of your target has a demoralising effect on the chaser. Having it in your sights, on the other hand, can help you find extra power you thought wasn't there. Right now, it's happening to me. That wheel ahead is now a rider in the distance, the road having kindly straightened out for stretch. Before I know it I've instinctively shifted up and I'm sailing past my competitor. I look down. Twenty one point five. I'm elated. Still 7.5km to go. The joy ebbs.

The giant chasm of rock through which the Sa Calobra threads passes by in a whirlwind of head-down pain – the only real inkling I have it's there is the prickle of skin as I plough on through the cold, damp air it harbours. Coming back out of its shadow to glimpse for a moment the distant sea has an oddly calming effect. Nearly a third of the way there.

The sea disappears behind me and the road makes a savage jump to 12% as it cuts back up the rock. For the first time since the start I'm out of the saddle, calling every muscle into service to see me past this tortuous bend and back onto something more gradual. Which it does. If gradual means a relentless drag of 7%. •



The rider's ride

Cervélo S3 Ultegra, £3,300, derby-cycle.com (or rent from bikecamp-mallorca.com for €75 per day)

As a bike more concerned with aerodynamics than weight-saving, the S3 might not have been my first choice for an uphill time-trial, yet I have to say it carried out its duties really rather well. Yes, it would definitely have benefited me to lose some weight around the wheels – the Mavic Cosmic Elite S wheelset is nearly 2.4kg when shod with tyres – but the frameset was spot on in terms of stiffness and air-slicing attributes.

Even at low speed it felt fast, but not as fast as the return trip down the Sa Calobra. There, the S3 platform came into its own.

Handling is sharp and precise – perfect for tight hairpins – while the massive down tube helps create an incredibly stable platform. All in all, the Cervélo is trustworthy to the nth degree.





• If there's one saving grace it's that this straighter road, my self-styled second sector, once again has the advantage of letting me see riders further on, so I attempt to distract my mind from my hurt and project it onto these others. Not that I want to demoralise anyone in normal circumstances, but being able to indulge a healthy dose of schadenfreude never did any suffering rider any harm. Goodness knows I've been the butt of that on many other occasions.

I pass the first rider, one of the guys I think I recognise from the rollers in the carpark, and then another, now just a blur through the condensation coating my glasses and the fog of suffering permeating my brain. It's still a boost to pass them both, not least as during that chase I realise I've negotiated turn one of the last phase – a series of 15 hairpins to the top.

By now I'm in something of a state. I rise and fall in and out of the saddle like someone's stuck me on a piston cam. I realise I haven't drunk a drop, nor eaten any of the three caffeine sweets I've taped to my top tube. A swig of water does wonders – better still the squirt I douse over my head. The sweet, on the other hand, is not such a revelation. My mouth is dry, breathing erratic and laboured, and I can't chew it without feeling like I'm going to choke. With all the force I can muster I spit it out. It lands back on my top tube pretty much where it had been before and sticks there. Disgusting, but I couldn't care less.

Regaining composure

Somehow I've settled again. It's not what I'd call a rhythm, but it seems to be working. I drop a couple of gears before standing to heave myself up and down through the hairpins' apexes,

trying to spin and accelerate before resolutely changing back up as I sit to pedal at a harder, lower cadence as the gradient peters slightly. Whether this is a useful tactic is uncertain, but I have various images of pros rising like startled stick insects from their saddles to attack similar bends, before reverting back to a seated, metronomic pace.

For the first time in what seems like hours I peer tentatively at my Garmin. Despite all the chasing and the feeling that I'm powering on, like I'm actually winning, it displays an average speed of 17kmh. I feel like I want to cry, if only to shed some more weight.

If there's one good thing about the final stretch it's that the mountain is so grey and sheer that I can barely make out where the road is snaking off to, let alone how much I still have to ride. In fact, the only sign it's still there is the occasional brightly coloured helmet of a rider appearing above like an iridescent pin thrust into the rock. The result is I'm riding blind, guided only by the markings on the road. Yet like so many tunnels of pain, like the thud of a punch, it's over in an instant. Suddenly I'm enveloped by a deafening sound, and looking up I half expect the population of Mallorca to be cheering me on.

They're not. Instead it's a sole enthusiastic supporter shouting himself hoarse in my ear and clapping fervently as he runs alongside. 'Venge Venge Venge, Allez!' he screams as we round the corner to the finish. But before I can either fall gratefully into his arms or rip his sunglasses off and toss them down the mountain (I'm unable to decide which), he sprints off back down the road, most likely to get in position to offer such services to the next rider, free of charge. •



My Garmin displays an average speed of 17kmh. I feel like I want to cry, if only to shed some more weight



Above: Hairpins conquered, Cyclist makes a final push for the summit

Above left: The road passes through an improbably small gap in the mountainside

Strava-bagger's delight

Four iconic test-pieces and their Strava masters

1 Hardknott Pass, Lake District

They say the apexes of the corners nudge 50%, and stretches of straight easily touch 30%, which makes Hardknott Pass the hardest climb in Britain, and one of the toughest in the world.

Length: 2.6km Max gradient: 30% Average gradient: 15% Strava KOM: Joe Clark, 11m21s (13.8kmh) QOM: Jessica Learmouth, 16m14s (9.6kmh)

2 Kitzbüheler Horn, Austria

Like Sa Calobra, the Kitzbüheler Horn plays host to an annual time-trial each summer (this year it's on July 25th). Start on cobbles and finish near an alpine cow.

Length: 6.7km Max gradient: 23% Average gradient: 13% Strava KOM: Javi Moreno, 29m15s (13.8kmh) QOM: In_a, 43m40s (9.3kmh)

3 Bealach na Ba, Scotland

The biggest paved vertical ascent in the UK, Bealach na Ba goes from sea level to 626m over 9km, making it the UK's answer to the Sa Calobra. Traffic isn't an issue, but the weather might well be. Length: 12.3km

Max gradient: 20% Average gradient: 7% Strava KOM: Gary Cunningham 34m48s (21.2kmh) QOM: Nat Munro 41m54s (17.6kmh)

4 Alto de L'Angliru, Spain

If pros have to get off and push, you'd better believe the road is steep. The region is known for its cider, too, but you'll be earning every drop.

Length: 13.2km Max gradient: 23.5% Average gradient: 10% Strava KOM:

Sariegotrainingsystem Tito, 57m18s (13.9kmh) QOM: Kate Vernonneau 1hr18m10s (10.2kmh)



I cross the line and keep going – the Strava climb finishes another 100m up the road

• The official finish is under an archway on a section of the Sa Calobra that sweeps through 270° up and over itself in a brilliant architectural flourish known as the Nus de sa Corbata, or 'the knotted tie'. It's quite something, and stunning to behold from above. Which is where I find myself heading. I cross the line and just keep going, because the 'official' Strava climb finishes at the highest point, the sign for Coll del Reis, another 100m up the road.

Once there, I finally stop, alone. I look down the mountain, beyond the knotted tie to the riders and even now some runners strung out on the roads below. It's a truly exquisite view, with not a coach or car in sight. Just people and their engines, valiantly battling up this beast. Against the clock. Against themselves. My Garmin beeps. Sixteen point seven. \$\text{\colored}\$

James Spender currently sits at 682nd on the Sa Calobra Strava climb out of 14,933 attempts





Do it yourself TRAVEL

Unless you charter a Bondvillain style biplane to the island, chances are you'll be

flying into Mallorca's capital, Palma, with prices on budget airlines out of London around £90 return in October, From there, it's a 90-minute drive to Sa Calobra. Or, if you don't fancy the hassle, luxury tour company Marsh-Mallows will organise airport transfers and...

...ACCOMMODATION

We stayed at the Hotel Esplendido on the scenic harbour of Port de Soller, with a great range of restaurants and bars, plus a gloriously sandy cove to swim in after a hard day in the saddle. The Esplendido's suckling pig is one of the best dishes you'll find on the island. Double rooms from €190 in October (esplendidohotel.com).

THANKS

Our stay was arranged by Dan Marsh of Marsh-Mallows luxury cycling holidays. If there's a good route to ride or restaurant to eat at, Dan's the man (marsh-mallows.com).



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Storck Visioner CSL



Vitus Vitesse



Orbea Orca M-TEAMi Cannondale SuperSix



Storck Visioner CSL

The price of this bike is outrageous – surely it should cost more?





THE SPEC Model

Storck Visioner CSL

Groupset

Shimano Ultegra 6800

Deviations

None Wheels

DT Swiss RC 38 Spline C

Finishing kit

Storck Carbon RBC220 bars, Storck Alloy ST115 stem, Storck Monolink MLP150 seatpost, Selle Italia Monolink SLS Black saddle

Weight

7.03kg (56cm)

Price

£3,549 (as tested); £2,199 (frameset)

Contact storck-bicycle.cc

epending on how you look at it, last month was either a glorious leap forward or a disheartening sidestep for the English language. The good folks at Scrabble added some 6,500 words to the official Collins Scrabble Word List, including 'dench', meaning excellent; the David Cameron favourite 'chillax', meaning to calm down; and 'cakeage', the levy restaurants charge for serving up cake (birthday cake especially) that diners have brought themselves (which in one London establishment is a staggering £9 per head). Love it or hate it, it's evidence that language is a largely evolutionary endeavour, and us cyclists enjoy that fact just as much as any.

After all, Cervélo coined the term 'squoval' to describe its ovalised, square profile tubes; 'crit' has just about replaced 'criterium' in general parlance, and 'podiumed' is used to describe a rider finishing in the top three (and incidentally, it's now a word you'll see on the Scrabble list too). Then there's 'reasonable'.

While 'reasonable' in the fiscal sense traditionally denotes the cost of goods or services one can stretch to buying without resorting to putting offspring to work in mills, it's recently been redefined by the cycling industry. Five hundred quid for a road bike is no longer considered a lot of money. In fact, if you speak to most serious shops they'll be directing you towards the £1,500-plus models and describing them as entry level. So, when the Visioner CSL appeared in the Cyclist office, with a pricetag of £3,549, I couldn't help thinking this was actually a bit of a bargain for a bike from a brand that tops out at £14,999 for its Aernario Signature bike.

Of course you might argue that I'm yet another sucker conditioned by a consumer industry into redefining my own monetary boundaries, and you might be right. But what you can't argue with is that at just under £4,000 the Visioner CSL is actually kind of mid-level in the context of today's road bike marketplace. Maybe, even, really rather reasonable. •







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With cost in mind, I merrily cycled off on a sunny Sunday morning aboard the Visioner CSL, half expecting it to be pretty average. The reason for my prejudice was that I've always known Storck to be a top-level but very expensive outfit. My previous experience of the brand was the Aernario Disc (issue 25), which was exceptional in every way, but which cost more than double this bike. Hence, I was prepared for the Visioner CSL to be half as good as its lavish older brother. How wrong I was.

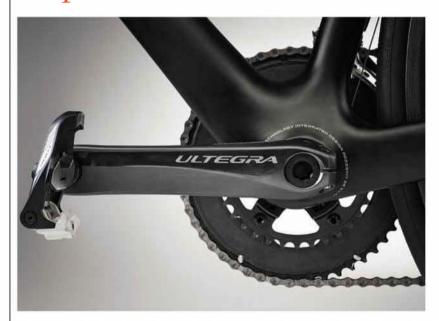
The initial feeling, not 100 metres down the potholed road outside my flat, was one of absolute, magic carpet-level comfort. I've ridden the Schwalbe One tyres on countless other bikes, and they were pumped up to my usual 95psi rear, 90 front. Likewise, the Storck-branded saddle is ostensibly the Selle Italia SLR I use wherever possible, so my posterior was pretty au fait with proceedings there too. So what, then, to attribute this plushness to?

At first I thought I might have a slow puncture, and I pulled over to inspect the bike. Tyres seemed fine, so with both feet on the floor and my hands on the lever hoods I gave the front end a couple of hard pushes downwards. And there was the first obvious candidate for the high damping levels. The whole front end flexed easily beneath me, with the bars visibly bending. Great for now, I figured, but might that be detrimental later? Ouite soon I realised that wasn't the case.

The shock of the new

My first big effort came at the foot of a short but steep climb into the Kentish countryside, one that always has me wrestling with the bars of a bike to urge it up the hill. Aboard the Visioner CSL things were no different except, quite apart from displaying the flex I'd expected, the front end kept up with every twisting effort. Yet, on the downhill, I could again feel the front of the bike kindly smoothing bumps on my behalf, almost like it had shock absorbers.

The back end exhibited this same blend too. Storck has always been one for oversized tubing, and the Visioner CSL makes no apologies for such lineage. As a result the down tube and chainstays meld into The initial feeling, not 100 metres down the potholed road outside my flat, was one of absolute, magic carpet-level comfort



a gargantuan bottom bracket that leaves you wondering if there will be enough space for the cranks to turn. The upshot is a very stiff pedalling platform indeed. However, the rear end's compliance, in that most coveted vertical plane, was quite astonishing.

I couldn't detect any real lateral give through the bottom bracket as I laid the power down, but yet neither did the Visioner CSL feel as harsh as such a stiff pedalling platform usually dictates. It was a remarkable feeling, and one that left me with quite a few questions for Mr Storck. •



The Visioner CSL is a very difficult bike to fault, and one that left me wondering if Storck has undermined its own top-end bikes

'We call it directional-dependent stiffness,' says Markus Storck. 'The bars, for example, are laid up in such a way that if you put one hand on the stem and pull the end of the bar up with the other hand it doesn't move much, it is very stiff. But when you push down there's 300% more vertical flex. It's the same on the seatstays, and also they are proportional, so the tube dimensions change depending on the size of the frame, so for a smaller frame there is more comfort as the riders are usually lighter. This is the same for the top tube and head tube, but it is the down tube that makes the real difference.'

Bending the rules

Storck explains that the Visioner CSL has not been designed with aero profiling in mind, hence its engineers had free reign to shape the tubes in a way to maximise comfort but preserve stiffness. Thus the top of the down tube has a profile shaped like a D rotated 90° to the left, the underside being flattened and the top being rounded. Storck says it is far easier to bend such a tube, and it's this

WHEELSET

The 38mm deep DT Swiss RC38C wheels perform excellently in crosswinds and pick up well. However, like many a carbon rim, braking in the wet was sometimes suspect.

• attribute that provides the Visioner CSL with its plush ride. Whatever the reasoning, it certainly works.

That said, it's curious to note that the Visioner CSL employs a 31.6mm seatpost. Current convention emphasises thin seatposts – 27.2mm, and even 25.4mm in the case of the Cannondale Synapse – as providing the flex to keep a bike comfortable without inhibiting lateral stiffness. Here again, though, Storck provided me with some interesting insights.

'You actually steer a bike with your centre of gravity, which is your butt,' he says. 'So if you use a skinny seatpost with a normal lay-up it will flex back, but also to the sides when leaning, seated, which you don't want when you're riding fast downhill corners. With a 31.6mm seatpost you don't have that side flex, but with the right knowledge – directional-dependent stiffness again – you can still engineer the post to flex back for comfort. If you understand the material there is no need to go to 27.2mm or 25.4mm seatposts.'

Hoisted by its own petard

All in, the Visioner CSL is a very difficult bike to fault, and one that left me wondering if Storck might just have undermined its own top-end bikes. Yet it hasn't – not quite. Since for all the comfort blended with stiffness, it still lacks an almost imperceptible edge – that of outright raciness. It possesses plenty of punch, but just somehow lacks that killer blow.

That killer blow is out there, in the Storck portfolio and from other manufacturers, but it will cost you, and have you redefining all over again what's reasonable to pay for a road bike. For the rest of us, the Visioner CSL is even more than you can reasonably expect for the money. **

The detail



One of the most striking things about Storck bicycles has always been their homogenous, almost organic look. Up front on the Visioner CSL is no different, with three of the most perfectly executed cable entries you will find on a bicycle. It's these details that have helped Storck stand out from the crowd, but yet, as Markus Storck says, all the form comes from fashion: 'We start each bike from the ground up. The reason they look how they do is purely down to the tube shapes that perform the best for the application we have in mind.'

Next year, says Storck, that application will be a full endurance bike range. However, for now, the Visioner CSL stands as a superb blend of race and endurance machine. And if the price still doesn't strike you, and you don't mind an additional 460g per frameset, the Visioner C, with the same geometry, is available for £1,059.







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Deviations

FSA SL-K Light BB386Evo chainset, FSA SL-K Light brakes, Shimano Ultegra cassette

Wheels
Fulcrum Racing 3

Finishing kit FSA SL-K UD carbon seatpost, FSA SL-K carbon stem, FSA SL-K compact handlebar, Prologo Scratch Pro saddle

Weight 7.35kg Price £2,699

Contact chainreactioncycles.com

itus is a bike brand that's been on a journey. In the late 1970s it became one of the few brands to experiment with aluminium, and created stunning frames with unusually skinny aluminium tubes. The consequence was a light and comfortable ride, but a frame that a powerful rider could flex under pressure. Despite that, it became a favourite for Grand Tour winners such as Sean Kelly and Lucho Herrera. The modern iteration of the brand has changed materials, and ownership, but has that essential character remained the same?

Back in issue 12, we reviewed Vitus's flagship Sean Kelly Ltd Edition. That was the first frame by Vitus to be used by the AnPost Chain Reaction Pro Continental racing team, and followed the brand's acquisition by online retailer Chain Reaction. With that frame, Vitus opted for an open-mould design – a design that is offered openly to any brand, usually by a Far Eastern factory, but with the specifics of the lay-up of the frame being

prescribed by Vitus. With this new version, Vitus has created its own design, and with that it has sliced a sizeable chunk off the overall price too.

When we saw the Sean Kelly, we were thoroughly impressed with a bike equipped with Sram Red and Mavic Kysrium SLS wheels for just under £3,500. Yet this new iteration truly puts the Sean Kelly to shame. With the majority of a Dura-Ace groupset, spliced with a fully carbon (and arguably more handsome) FSA crankset, this is a level of value offered by very few competitors. Add in the carbon finishing kit and Fulcrum Racing 3 wheels, and we're in a slight state of disbelief that Chain Reaction can sell this bike at just £2,699 (the components alone would cost more than that at retail price). Yet that value all hinges on the quality of one key element – the frame.

Stepping forward

On first impressions, the Vitesse was very much to my tastes, but I felt as though it may not find as much •



TIME TO CLIMB



DROMARTI

• favour with others. As with the Sean Kelly, the Vitesse is fast yet harsh, but this bike is very much a different experience to its predecessor.

Having been designed in conjunction with the AnPost pro team, designer Dale McMullan confesses that the team's performance criteria were narrow: 'The pros just want the bike to be as stiff as possible all the time, and in all honesty they don't care much about the possible comfort sacrifices.' Of course, Vitus has designed the bike with the consumer in mind, so it is not a complete concession to stiffness.

'We had in mind guys riding sportives too, so that bike has to be comfortable as well,' McMullan says, 'and ironically one of the first things the team said about the bike was how they preferred the comfort aspect.'

That said, it is still extremely stiff. In fact, after just a few pedal revolutions I was immediately planning to take the bike to a crit circuit to test it against the field in a race. No matter how hard I stamped on the



pedals, it seemed to resist any impulse to flex, especially around the bottom bracket.

An increasing trend among manufacturers is the use of wider bottom bracket shells to create more stiffness at the rear without sacrificing comfort from the rest of the tubes. The Vitesse uses BB386, which is the widest bottom bracket and also has the thickest axle width.

'For me it was a no-brainer,' McMullan says. 'That wide pedalling platform offers so many advantages. It means that we can create a frame with a lower weight – we don't have to throw extra carbon layers in there to help stiffen it up, and the pure size of the structure has meant that we can use asymmetric chainstays.'

Comforting thoughts

Despite its stiff, racy feel, comfort has not been thrown out of the window. Over small disturbances or generally heavy roads, it does an excellent job of filtering out the buzz, but while not numbing the rider to the traction and feel of the road. That's likely to be a consequence of the top tube and seat tube offering some forgiving flex for lesser impacts. It's over serious dents or imperfections in the road that the bike is a little too robust and unsettled. Part of that may come down to the stiffness of the straight-bladed fork, which offers little mediation between road impact and the rider's hands. \triangleright





COMPONENTS

The Dura-Ace 9000 shifters and derailleurs are a great addition to the Vitus build. While the Vitesse is short of a full Dura-Ace groupset, swapping in some FSA components, the group's excellent shifting is in no way sacrificed, and contributes a lot to the bike's racy character.

I always felt confident heading into corners, aided by informative feedback of the road surface through the frame





in fact Vitus hasn't skimped on the specification. The FSA chainset, for instance, offers a carbon finish that complements the aesthetics of the overall build, but with no palpable stiffness sacrifice. And it comes in 60g lighter than the Dura-Ace equivalent. Indeed, I'd guess that Vitus opted for the FSA crankset more for compatibility with the BB386 than for any reason to do with costs. For this level of racer, the mid-compact 52-36 chainrings are perfect for the task at hand, meaning you'll never spin out in a fast group but can still tackle a formidable ascent.

The Vitesse is an extremely well-considered build, but its greatest strength is probably that it creates a sensation of rigid power delivery that means the frame begs to be ridden hard, and offers copious speed as a reward. With the bike's low weight, impressive spec and handling prowess, this is a fully capable, fully fledged race-ready machine that wouldn't be out of place in a pro race. That's saying a lot at this price. \$\frac{\pi}{2}\$

• The geometry of the frame also does something for the general comfort of the bike, as its curves seem to place it into the endurance road category. The geometry is strikingly similar to the likes of the Specialized Tarmac, only with a shorter (arguably racier) head tube and marginally longer wheelbase, which adds a little to the smoothness of the bike on descents.

Indeed, handling was consistently impressive on the Vitesse. I always felt confident heading into corners, aided by informative feedback of the road surface through the frame. It encouraged me to push harder and pick up speed faster without fear for the bike's stability, hampered only by the weakest aspect of the build – the FSA SL-K Light brakes. The brakes are certainly capable, but in comparison to the Dura-Ace alternative for which they were swapped, they were slightly lacking. The power and modulation were both ever so slightly diminished, which caused me to brake slightly earlier into corners than I would have wanted.

That's not to give the impression that the nonstandard parts on the Vitesse are a sacrifice, and

The detail



Vitus has equipped the Vitesse with FSA componentry throughout the build, also using FSA in place of some of the standard Shimano transmission. While the FSA SL-K kit sits just below the top-tier K-Force components this is still high-end equipment for a bike in the £2k-£3k bracket. Seeing a carbon stem, seatpost and handlebar on a build at this price is astoundingly rare. The finishing kit provides a welcome combination of stiffness at the cockpit and some flex in the seatpost - ideal for long. strenuous days. While the SL-K brakeset left a little to be desired in comparison to Dura-Ace, it still did its job efficiently enough. It's encouraging that at a price point where finishing kit is commonly sacrificed for cost purposes, Vitus has surpassed expectations with the Vitesse.

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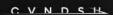
















Orbea Orca M-TEAMi

This Spanish brand may be modest about its achievements, but it has a lot to shout about





THE SPEC

Model
Orbea Orca M-TEAMi

Groupset

Shimano Ultegra Di2 6870

Deviations

None

Wheels

Mavic Ksyrium SLR

Finishing kit

FSA OS-99 stem, FSA K-Force Compact handlebars, FSA K-Force Light Di2 seatpost, Prologo Scratch saddle

Weight

6.65kg

Price £5.800

Contact

orbea.co

hen the box marked 'Orbea' arrived at the *Cyclist* offices, I didn't leap off my chair to open it, in the way I might have done with some of the more 'notable' arrivals. I don't think of myself as a bike snob, but I'll admit that some bikes get me more excited than

'notable' arrivals. I don't think of myself as a bike snob, but I'll admit that some bikes get me more excited than others, and I guess I was expecting the latest Orbea Orca M-TEAMi to be just another Ultegra Di2-equipped carbon road bike, much like those from a dozen other brands. But I don't mind admitting when I'm wrong.

Ask a bunch of UK riders to name 10 high-end road bike brands and I'd wager Orbea wouldn't be on anyone's list, but that's possibly just a reflection of its modesty in self-promotion on our shores. Elsewhere in Europe it's a much bigger player. In fact the Basque manufacturer has a heritage that would put most of the 'big-hitters' in its shadow. Amazingly, this year sees the company's 175th anniversary (not all in bike building, admittedly). Its first bikes were produced in the early 20th century,

and from its base in Eibar, close to Bilbao in northern Spain, Orbea produces one of the largest bicycle inventories on the planet.

Humble in success

In its time, Orbea has been heavily involved with racing, sponsoring professional teams since 1970, amassing an enviable palmares along the way. Pedro Delgado was the company's first Grand Tour winner, with victory in the 1985 Vuelta a Espana, which led to the company's expansion and a boost in global bike sales.

Orbea also had a long and successful relationship with the Basque squad Euskaltel-Euskadi until it disbanded in 2013. At the 2008 Beijing Olympics, Orbea bikes won gold medals in both the men's road and mountain bike races (not to mention a silver medal in the mountain bike event too), yet the brand remains humble compared to most, rarely shouting about its achievements. It certainly knows its stuff when it comes to high-end bike building •



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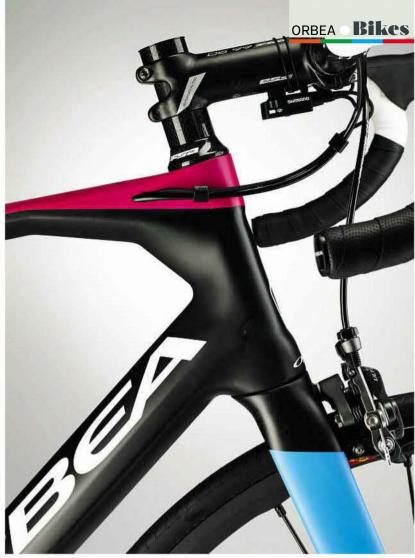
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• and I'm sure if this were an American or Italian brand, things would be markedly different.

The Orca was launched in 2003 as Orbea's flagship race machine, but fast-forward to 2015 and this fifth generation is the race bike for Team Cofidis this season. Having tested a previous iteration, I can say that this is a far prettier version, losing some of the bulky faux-aero traits of its predecessor and becoming a lot sleeker in appearance. It's lost a chunk of weight in the process too, and this is the lightest ever Orca. Orbea, again perhaps over-modestly, chooses not to quote actual frame weights, but our scales measured the complete test bike (size 55cm) at a very svelte 6.65kg, which puts in the same territory as some of the lightest race bikes.

I'm also a fan of the blue and pink paintjob, but that might be mainly because it makes a nice change to see a bike that isn't simply matt black. (Of course, a matt black option is available for those who want the stealth look). It's undeniably a striking and attractive colour scheme,





The M-TEAMi possesses a level of responsiveness and comfort that far exceeded my expectations



and that's not just my opinion. When I did a poll of various friends and random strangers, I'd say the positive reactions to the pink and blue outweighed the negatives by about 20:1. As an aside, Orbea uses only water-based paints as part of its commitment to providing better air quality for its workers and less harmful waste in the environment, which has to be applauded.

Above and beyond

Despite my initial indifference to the Orca on its arrival, as soon as I took to the road the M-TEAMi impressed me. It possesses a level of responsiveness and comfort that far exceeded my expectations, and I quickly found it becoming the bike I most looked forward to riding on test days. The geometry of the 55cm bike suits my fit coordinates almost to the millimetre, which helped me focus immediately on the bike and not have to fuss over early niggles and continual minor adjustments to the set-up. The only change I made was to swap the Prologo Scratch saddle for my preferred, flatter Zero II model by the same brand.

On the road the Orca M-TEAMi feels smooth yet purposeful. Out of the saddle, the fork's wide stance helps to delivers solidity up front during short sprint •



Despite the solidity, the ride never feels overly harsh – a combination that most brands aim for but only a few attain

• bursts and punchy hill efforts. The bottom bracket area and rear end do the same, as do the Mavic Ksyrium SLR wheels with great lateral rigidity, all of which helps to keep things moving quickly on the climbs, especially when the gradient gets really steep, as it often does in my favoured testing ground around Dorset's coastal lanes.

Seated, the power transfer feels equally assured, as does the handling on descents. Despite the solidity, the ride never feels overly harsh – a combination that most brands aim for but only a few attain. The 27.2mm seatpost certainly helps with the comfort, but it's the final additive to a well-designed frame, rather than the main ingredient. Plenty of bikes spec the same FSA carbon post and don't achieve the same sensation.

Orbea claims the smooth ride feel is due to frame construction techniques borrowed from its highly successful Alma mountain bike, which have been adapted for use in the 2015 Orca. It appears to have worked. The Orca coped admirably with all I threw at it, including several gravel rides on a short trip to northern California during this test, with the only change being a switch out of the Mavic Ksyrium SLR wheelset for a tubeless Bontrager Aeolus wheel and 25c tyre set-up, predominantly for puncture protection.

With this upgrade, the bike's performance steps up another notch. The subtle improvements the Bontrager wheel and tubeless tyres bring to the ride quality makes it an even more exciting prospect and I thoroughly enjoyed every hour on board the Orca on those rides (which you can read more about in an upcoming issue). At the end of a gruelling 80-miler, I felt ready for more, and that's a rare thing.

Initially my expectations for the Orca M-TEAMi were as modest as the brand itself, but having had the pleasure of its company this past few months, it impressed me so much that now I'll genuinely be sorry to hand it back. *

BOTTOM BRACKET

Or rather, no sign of a bottom bracket: the pressfit 86 design provides the bearings with a wide stance for maximum lateral stiffness, plus it looks super neat and clean too.



The detail



Orbea's OMR full carbon fork is a unique design. Rather than the fork legs tapering evenly all the way from the head tube to the wheel axle, they remain as narrow as possible for the upper section before, at about three-quarters of the way down, stepping out to meet the front hub. It creates an unusual look, most noticeable when you're riding out of the saddle and viewing from above. It looks purposeful, and performs in kind, handling lateral loads with a solidity that gives you confidence in the front end, whether you're sprinting or descending. The fork also offers ample feedback and vibration absorption.





Cannondale SuperSix Evo

Cannondale has made an Evo for women, but are you the kind of woman it has made the bike for?





THE SPEC
Model
Cannondale SuperSix
Evo Women's Ultegra 3
Groupset
Shimano Ultegra 6800
Deviations

Deviations
Cannondale HollowGram SI
crankset. FSA chainrings

Wheels
Mavic Aksium WTS
Finishing kit
Prologo Nago EVO Dea
saddle, Cannondale C2
UD Carbon seatpost,
Cannondale C2 Women's

Compact Wing bars
Weight
7.95kg
Price
£2,000
Contact
cyclingsportsgroup.co.uk

or many years Cannondale resisted the lure of carbon, preferring to focus on developing high-quality aluminium frames. When it did embrace carbon in 2003, 20 years after producing its first bike, it only went halfway – the Six13 was a composite frameset that used both carbon and aluminium.

The big deal with the Six13 was that it was ultralightweight. In fact, the bike was so light that it didn't meet the UCI's minimum weight requirement of 6.8kg. But rather than shuffle back to the workshop to add lead weights and pour a couple of bags of sugar into the tubes, the company saw it as an opportunity and launched a marketing slogan: 'Legalise my Cannondale'. Genius.

A decade later and Cannondale is still producing super-lightweight bikes, and has fully embraced carbon technology. The SuperSix Evo Women's Ultegra 3 is a women's version of the award-winning SuperSix Evo, the WorldTour bike currently ridden by Ryder Hesjedal and the rest of the Cannondale-Garmin pro team.

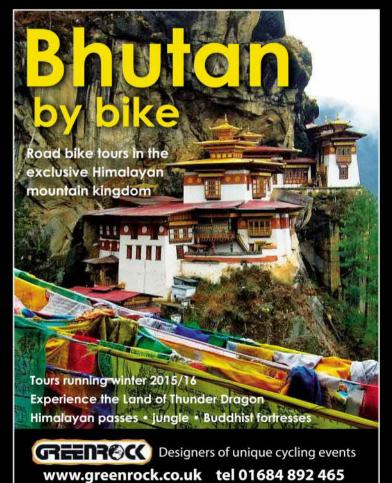
With a weight of less than 700g the Evo is one of the lightest production frames in the world, and this sibling is also a featherweight, sitting in the middle of a six-tier women's range. At the top of the range is the Evo Women's Hi-Mod Black Inc, which comes with all the trimmings and retails in the United States at \$8,120 (£5,315) but sadly is not stocked in the UK, so we can only dream. At the other end of the scale is the more moderately priced entry-level women's Evo (£1,499), which comes with a Shimano 105 groupset. Yet all the bikes in the range share much the same technology and are modelled on what Cannondale calls its 'women's specific elite geometry'.

Spot the difference

This bike is designed for women, although you may have to get out your magnifying glass to see the differences between it and the unisex Evo (I won't describe it as a men's Evo because many women still don't see the need •









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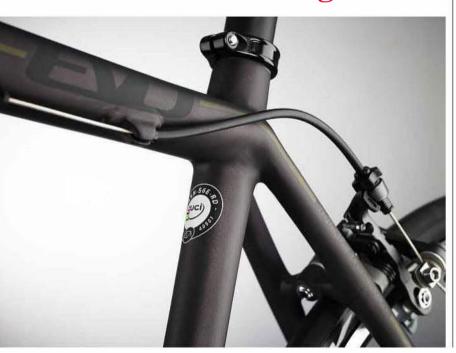




MADISON:



This is one of the stiffest bikes I've ridden. Even on my first jaunt it became apparent that the SuperSix Evo is built for racing



WHEELSET Wheels maketh the bike and while the Mavic Aksiums are solid they might be holding the SuperSix Evo back from being the ultimate race machine for women

of for bikes that have been tweaked and adjusted for their needs). The main difference is that the women's bike has a more sloping top tube to reduce the standover height to accommodate women's (generally) shorter legs. Beyond that, the 'women's specific elite geometry' amounts to a couple of millimetres extra on the head tube, and a millimetre or so off the horizontal length of the top tube, plus a degree of difference here and there for the angle of head and seat tubes.

It's all pretty minimal but the outcome is that, measured in terms of stack and reach, the women's bike is a touch taller heightwise and a hint shorter lengthwise than the standard Evo. It's plainly designed with the female form in mind, but it makes for a slightly less racy position – more upright, less stretched out – so women who want to race hard rather than ride smooth may still be more tempted by a smaller size in the unisex geometry.

At least Cannondale has resisted the temptation to girlify the frame, and following a forensic inspection of the bike I am happy to report that there is not a single butterfly or flower motif anywhere on the Evo frame (one day life will become equal and footballs and trains will feature on bikes for men). There is a hint of purple, but I'm prepared to overlook that because, rather than it being a Disney Princess magenta, the deep lavender sheen is a subtle background suggestion that sits behind a matt black topcoat, and it all looks very stylish.

Other concessions to women's dimensions include the Cannondale C2 Women's Compact Wing handlebars, whose slim hoods are a nice touch for smaller hands. The bar shape sets the brake lever position closer to the bars to make braking and gear changing easier too, but at 40cm wide the bars are a touch bigger than the standard 38cm women's handlebar I'm used to.

As for the saddle, I haven't had much personal success with Prologo in the past, but the Nago Evo Dea saddle has been designed to fit the female form and suits those with wider sit bones, and I found it pretty comfy. Men who are blessed with a wider physique may like to try it out too.

Measuring up

I'm not sure it's wise for bike manufacturers to use superlatives - the best, the fastest, the most amazingest to describe their bikes, because it's all rather subjective. One woman's perfect steed could be another woman's donkey. So when Cannondale describes the SuperSix Evo Ultegra 3 as 'The best bike in the world, re-engineered for women', I'm tempted to ask, 'Best for whom? Engineered for which women?' Without quantifiable measurements it's all just hot air.

In its defence, Cannondale claims this bike has the best stiffness-to-weight ratio ever recorded, at 142.3 newton-meters per degree of deflection. However, Cyclist has yet to construct a laboratory with a O



'Flex zones' in the chainstays and seatstays do a good job of keeping the rear wheel grounded

• stiffness-measuring machine so I'm unable to verify this particular manufacturer claim.

What I can say is that this is one of the stiffest bikes I've ridden. Even on my first jaunt around the park it became apparent that the SuperSix Evo is built for racing and not necessarily endurance. It handles precisely and grips the road like glue. 'Flex zones' in the chainstays and seatstays do a good job of keeping the rear wheel grounded (without them you could find yourself pinging all over the place every time you hit a bump) and it carves through corners and down hills with an assuredness that inspires the confidence to ride aggressively.

Having ridden a fair number of £2K women's bikes over the past couple of years, most of them have been designed and specced with the sportive market in mind, so it comes as a pleasant surprise to jump on the SuperSix Evo and get the urge to head to my local crit.

That said, it could still be more sprightly, as I discovered on a lumpy 90km ride to the coast, where I felt I wasn't skipping along with quite as much speed as I'd hoped. I put this down mainly to the wheels. The Mavic Aksium WTS wheels and tyres add more than 2kg to the overall build and are a touch sluggish when accelerating and climbing, and if I was intending to race this bike I would be looking to swap them for something a bit lighter and, well... racier. They're not bad wheels – they cost twice what you'd get on some other bikes at a similar price point – they're just not a match for the very light and stiff frame.

Overall this is a well-appointed bike with a clear objective – to be fast on the road and in a race situation. Whether it's the best bike in the world remains a matter of opinion, but I have to say that I have come across very few bikes at £2,000 that can truly rival this one. \clubsuit

GROUPSET

If it's assured reliability you want in your shifting, Shimano's Ultegra 6800 groupset is a no-brainer.

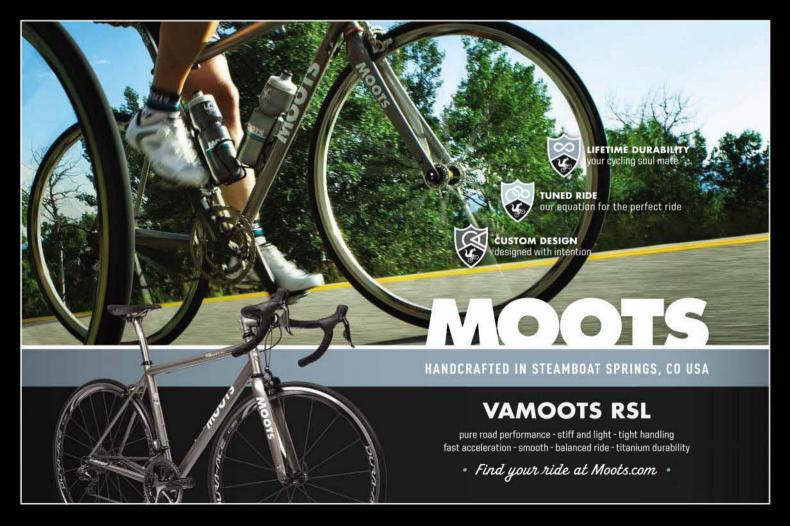
The detail

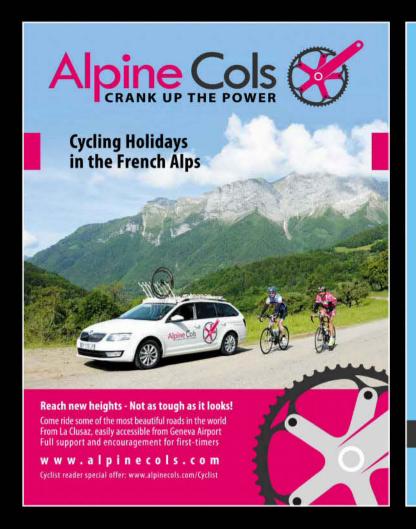


When a manufacturer elects to swap out a chainset from the standard groupset offering, in this case Shimano's Ultegra 6800 crank, it's often a sign of cost cutting to hit a price point. That's not what's happened here, though. Cannondale's Hollow Gram Si chainset could be considered an upgrade, offering one of the lightest and stiffest cranksets (using the BB30 standard that Cannondale itself pioneered) money can buy. As the name suggests, the aluminium 3D forged cranks are hollow, made in two pieces and seamlessly joined, with many years of pro rider input honing the design. It justifies why these cranks are included on all of Cannondale's top-level bikes.











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Campagnolo Bora Ultra 35 Clincher

The Italian company has turned its topend tubular wheel into a clincher – but has it lost anything in the transition?

Words **PETER STUART**

ampagnolo lays claim to many innovations in cycling – the quick release and the parallelogram derailleur among them – but the brand also holds fast to some cycling traditions, one of which being the old rule that racers ride on tubular tyres. So until now, Campag has never offered a clincher option for its top tier of carbon wheels.

The Bora has become something of an icon in pro racing. It's been a staple since its introduction in 1994, when it was a trendsetter as a deep profile carbon rim. Its appearance hasn't changed a great deal, but that's not to suggest the wheels haven't progressed. Boras were an early proponent of ceramic bearings, and recent years have seen some dramatic changes in the detail. Campag developed what I consider to be the most elegant solution to the problem of the poor braking performance of carbon fibre wheels by shaving off the smooth layer of resin to leave the exposed carbon fibre. The advantage is greater friction at the surface, an ability to create a more consistently parallel brake track and a solution to the problem of water collection on the resin exterior. It may sound like a gimmick, but it works.

'Maintaining a structure that was as resistant to braking forces, both in regards to heat dissipation as well as flex is more complex when taking into account the "hooked" or "lipped" structure of a clincher wheel,'





The wheels spin up to speed quickly and suffer no flex in side-to-side sprint efforts

• says Campagnolo's Joshua Riddle. 'Where a tubular is one solid complete structure, the clincher has two "beads" that must be supported on each side.' Thankfully, though, there seems to have been no sacrifice in braking. In contrast to the unpredictable performance of cheaper carbon clincher rims, the Bora's consistent bite as brake pads meet the rim was a delight. It felt virtually identical to tubulars. But there certainly are some other differences between this and the tubular wheelset.

Weighing up

This year has seen a shift to a wider profile for the Bora rims, both for the tubulars and this new clincher. Rather than exulting the newfound aero benefits, though, Campagnolo argues the change offers two very different advantages: a wider rim bed to improve the overall profile of a wider tyre, and a reduced weight. 'Structurally, having the wider rim actually allows the engineers to employ less material than in the narrower version,' says Riddle. 'The result is a stiffer rim that actually weighs less.'

That said, this clincher wheel does carry a weight penalty, coming in at 1,370g for the pair compared to the tubular weight of 1,160g. They're not the lightest clincher wheels on the market, but are still impressively light given the medium aero profile – 200g lighter than the similarly shaped Zipp 303.

More importantly, the Boras *feel* light once clamped into a bike. The wheels spin up to speed quickly and seem to suffer no flex in side-to-side sprint efforts (usually detectable by the gentle rub of brake pads). Their lightness and stiffness becomes really noticeable when flying up inclines.

While Campagnolo doesn't scream about the aerodynamics, the wheels did seem to carry speed

well, and I noticed slight improvements in my top speeds on descents compared to standard box-section rims. The more impressive characteristic, though, was stability. Where middling aero profile wheels can often be blown around in strong crosswinds, the Boras were stable in all conditions – offering heaps of handling confidence.

Inevitably, there are performance sacrifices from the conversion to clincher, but also some benefits. While the tubular's responsive feel makes it a favourite for racers, clinchers consistently show lower rolling resistance and often better aerodynamics in industry testing. And I was reminded of the practical superiority of clinchers on my very first ride on the Boras, when a shard of glass went through the tyre and a quick inner tube change saved me from a three-mile walk to the train station.

Bargains galore

Mad as it may sound, at £2,238 the Boras are actually reasonably priced. They are, after all, from a company that prides itself on being unashamedly more expense than everyone else. In fact the Bora Ultra is cheaper than the top shallow-profile offerings from Zipp, Shimano and Reynolds. What's more, at £1,526 the Bora One alternatives are right at the midpoint of the market for fully carbon clincher wheels, with only a slight sacrifice in weight and a more basic set of bearings.

Perhaps a true evaluation of the wheelset will be possible only after several years of use, when the longevity of the carbon brake surface and the overall wheel package will be more evident. Historically, though, the Boras have performed well and there's no reason to doubt that these will hold up to all but the harshest of year-round weather. In my time testing them I put them through some rotten conditions (and serious potholes) and they showed no sign of weakness.

While the Boras may lack the claims of aerospace R&D being boasted by other big wheel brands, they have a distinctive character, and even a distinctive sound, that resonates with my inner racer. It's a consistent quality of many Italian cycling brands, and it has proven to be very much to the tastes of WorldTour pros. To have that same seamless and smooth ride quality without the need of a support car is certainly an exciting prospect. ��

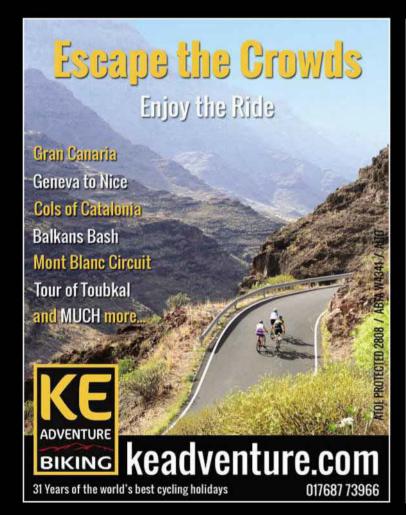


LACING

Campagnolo uses a distinct lacing pattern with the Bora range. The G3 lacing pattern employs three parallel spokes as opposed to two, with the right side of the hub equipped with twice as many spokes as the left. It promises better power transfer and stiffness at a lower weight.









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From left to right, top to bottom

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De Rosa Embroidered T-shirt, €28 (approx £20) i-ride.co.uk

Smith Optics Essential T-shirt, F14 saddleback coluk

Cyclist T-shirt, £25 cyclist.co.uk/store

Bianchi Logo Vintage T-shirt, €27 (approx £20) uk.bianchi.com

Castelli Advantage T-shirt, £20 saddleback.co.uk

Condor Head Badge T-shirt, £19.99 condorcycles.com

Morvelo Collage Tee T-shirt, £25 morvelo.com

Cinelli Columbus T-shirt, £21.99 chickencycles.co.uk

Cannondale Pro Team Casual Tech Tee T-shirt, £25 cyclingsportsgroup.co.uk

De Rosa Embroidered T-shirt, €28 (approx £20) i-ride.co.uk

Bianchi 130 Anniversary T-shirt, €27 (approx £20) uk.bianchi.com

Cinelli Laser T-shirt, £21.99

Cyclist T-shirt, £20 cyclist.co.uk/store

Castelli Rosso Corsa T-shirt, £20 saddleback.co.uk

Louis Garneau Chill Tee T-shirt, £14.99

evanscycles.com

Bianchi Head Badge T-shirt, €27

(approx £20) uk.bianchi.com

Brakes Organic Cotton Cycling T-shirt, £21

velodrome.cc

Condor Women's Bike Illustration T-shirt, £19.99 condorcycles.com

Enve Seal T-shirt, £20 saddleback.co.uk

Cannondale Tech Tee T-shirt, £24.99 cyclingsportsgroup.co.uk

Pedalling Facts p47

Louis Garneau Course Race jersey, £119.99 evanscycles.com

Assos T.campionissimo_s7 bibshorts, £309.99 vellow-limited com

Assos Mille Summer socks, £13.99 vellow-limited.com

Shimano R321 Carbon shoes, £299.99 madison.co.uk



In Praise Of Leg Shaving p65

Northwave Sonic bibshorts, £59.99 i-ride.co.uk

Endura FS260-PRO socks, £18.99 (twinpack) endura.co.uk

Mavic Cosmic Ultimate shoes, £260 mavic.com



Lord Of The Ring p90

RIDER LEFT

Rudy Project Sterling helmet, £124.99 yellow-limited.com

BBB Impact PH Sport sunglasses, £119.95 windwave.co.uk

Gore Bike Wear Xenon S jersey, £109.99 goreapparel.co.uk

Endura FS260 PRO-SL bibshorts, £99.99 endura.co.uk

Endura FS260 PRO Aerogel Mitt II gloves, £26.99 endura.co.uk

Gore Bike Wear Oxygen socks, £13.99 goreapparel.co.uk

Pearl Izumi Elite RD III shoes, £159.99 madison.co.uk

RIDER RIGHT

Kask Mojito helmet, £120 velobrands.co.uk

Oakley Radar EV Pitch sunglasses, from £135 uk.oakley.com

Gore Bike Wear Oxygen Windstopper Softshell jersey, £109.99 goreapparel.co.uk

Gore Bike Wear Power 3.0 bibshorts, £99.99 goreapparel.co.uk

Gore Bike Wear Oxygen socks, £13.99 goreapparel.co.uk

Specialized Body Geometry Gel Mitt, £29.99 specialized.com

Specialized Body Geometry Trivent shoes, £129.99 specialized.com

Waiting To Exhale p108

Specialized Propero II helmet, £69.99 specialized.com

Oakley Radar EV Pitch Tour de France sunglasses. from £205 uk oakley.com

Assos SS.Mille_s7 jersey, £99.99 vellow-limited.com



Cav's Stomping Ground p124

Lazer Z1 helmet, £199.99 madison.co.uk

Oakley Radarlock Path sunglasses, from £145 uk.oakley.com

Madison Road Race thermal jersey, £74.99 madison.co.uk

Madison Road Race bibtights, £119.99 madison.co.uk

Specialized Body Geometry Gel mitt, £29.99 specialized.com

Specialized Body Geometry Expert Road shoes, £160 specialized.com

The First Tour p152

Giro Synthe helmet, £199.99 zyro.co.uk

De Marchi Cinelli 1970 jersey, €150 (approx £110) demarchi.com

De Marchi D.S. Merino jersey, €144 (approx £110) demarchi.com

De Marchi Zuava Knicker, €160 (approx £115) demarchi.com

De Marchi Wool Sock, €15 (approx £11) demarchi.com

Northwave Extreme Tech Plus shoes, £299.99 i-ride.co.uk

The Snake Of Truth p168

Giro Aeon helmet, £169.99 zyro.co.uk

Oakley Radar EV Pitch sunglasses, from £135 uk.oakley.com

Castelli Climbers jersey, £80 saddleback.co.uk

Castelli Body Paint 2.0 bibshorts, £175 saddleback.co.uk

Rapha Pro Team socks, £15 rapha.cc Northwave Extreme Tech Plus shoes, £299.99 i-ride.co.uk



Bikes p179

STORCK

Lazer Z1 helmet, £199.99 madison.co.uk

Oakley Radar EV Pitch sunglasses, from £135 uk.oakley.com

Sportful R&D Ultralight jersey, £85 c3products.com

Sportful BodyFit Pro bibshorts, £125 c3products.com

Rapha Pro Team socks, £15 rapha.cc Northwave Extreme Tech Plus shoes, £299.99 i-ride.co.uk

VITUS

Scott Vanish Evo helmet, £89.99

Oakley Heritage Racing Jacket sunglasses, from £190 uk.oakley.com

Pearl Izumi Pro Ltd Speed jersey, £99.99 madison.co.uk

Assos T.campionissimo_s7 bibshorts, £309.99 yellow-limited.com

Assos Mille Summer socks, £13.99 yellow-limited.com

Shimano R321 shoes, £299.99 madison.co.uk

ORBEA

Lazer Z1 helmet, £199.99 madison.co.uk

Oakley Radarlock Path sunglasses, from £145 uk.oakley.com

Castelli Volo jersey, £75 saddleback.co.uk

Castelli Free Aero Race bibshorts, £140 saddleback.co.uk

Castelli X13 socks, £14

Shimano R321 shoes, £299.99 madison.co.uk

CANNONDALE

POC Octal helmet, £225 2pure.co.uk

Adidas Evil Eye Halfrim Pro sunglasses, £170 adidas.co.uk

POC Women's Essential AVIP jersey, £145 2pure.co.uk

POC Contour bibshorts, £200

Pearl Izumi P.R.O. Leader II shoes, £229 madison.co.uk

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Froome's loss is our gain

It's been billed as 'anti-Froome', but this summer's Tour de France should still be a thriller for fans, says Eurosport pundit Felix Lowe

ne former winner was all at sea when the route of the 2015 Tour was announced. Chris Froome was out sailing with his Sky teammates when the penny-farthing dropped: more mountains, less time-trialling. Here was a route favouring the kind of spontaneous, attacking riding that laughs in the face of marginal gains.

Even hijacking his Sky lieutenant's luxury Giro campervan – the Richie Porte-A-Cabin™ – may not be enough for a rider who clearly feels he needs a long individual time-trial to edge ahead of his more climbing-minded rivals – Alberto Contador, Nairo Quintana and Vincenzo Nibali. So incensed was the 2013 champion he even considered skipping the Tour for the Vuelta a Espana. Which is

ironic, considering the current noise about the 'Vueltaisation' of the Tour.

With shorter, harder stages, five highaltitude finishes and only minimal timetrials, it's true this Tour resembles the Vuelta more and more. Or should that be Mur and Mûr? For the third stage in Belgium finishes atop the punchy Mur de Huy climb used in the Flèche Wallonne classic, while Stage 8 culminates on the Mûr de Bretagne – a brute known as the Alpe d'Huez of Brittany.

It will visit the real Alpe, too, with a rambunctious penultimate day that runs just 110km and features the goliath of the Col du Galibier ahead of those 21 sinuous switchbacks. Earlier, on Stage 19, the little-known Montvernier offers a fresh set of

hairpins – 18 of them in just 4km of climbing – while La Pierre Saint-Martin on Stage 10 rises steadily for 25km, peaking at 15%.

Add in the Tourmalet, Croix de Fer and the misleadingly named Plateau de Beille (a climb whose distinct lack of plateaux reduced me to a hallucinating wreck while riding the Ariégeoise sportive for *Cyclist* – see issue 27) and you have a winning hand in a game of Tour Climbs Top Trumps.

Before any of the favourites reaches those mountains, we'll have to keep our fingers crossed that they all survive the Stage 4 cobbles – another slap in the face for Froome, who was so worried about the pavé last year that he broke a wrist merely in anticipation.

But here's the clincher: in the entire 3,358km race we'll witness less timetrialling than the solitary hour we spent glued to the screen watching Wiggo go round in circles in a velodrome. The whole Tour includes just 42km of TT, of which 28km are a team affair, with the remaining 14 coming on an opening day in the Netherlands that could be windier than the baked bean scene in *Blazing Saddles*.

Yes, Froome has every reason to smell something fishy. It's as if the Tour organisers have already engraved Quintana's name on the trophy – the only rider of the Big Four yet to wear yellow into Paris.

That said, the 102nd edition of the Tour should be as unpredictable as a British general election. The reintroduction of time bonuses in the opening week means any number of sprinters may lead the race – and there's little reason to think that the sequence of six different riders on the podium in the past two years can't continue.

By my reckoning that opens the door to Contador, Bardet and, well, take your pick from Majka, Porte or Valverde. I would say Rolland, but any benefit he garners from that short ITT will be lost in the later 28km TTT with his ramshackle Europear teammates.

And supposing Froome does falter, then us Brits will at least have a resurgent Mark Cavendish to cheer on – especially with rival Marcel Kittel's season looking more barren than the summit of Ventoux. Throw in Adam and Simon Yates from Orica-GreenEdge, and there hasn't been as much twins excitement since Arnold Schwarzenegger and Danny DeVito were united on the silver screen.

That was back in 1988, the year the man who claims this latest route is 'an anti-Froome Tour' – Pedro Delgado – won the maillot jaune. If this July is even a fraction as good as that, the first Tour I watched on Channel 4, then we're all in for a treat. Felix Lowe is dusting off the old VHS recordings in anticipation

HUEZ*

